NEW YORK • LONDON

WORLD PETROLEUM

U. S. Tanker Construction Near Peace Time Peak • Near East—Strategic Oil Centre; Recent Concessions and Extraordinary Development Indicate Tremendous Future Importance • Mechanics of Deep Well Drilling • One Year's Operation of Manchukuo's Petroleum Monopoly

AUGUST • 1936

FIFTY CENTS OR TWO SHILLINGS THE COPY

STA-VOL-ENE

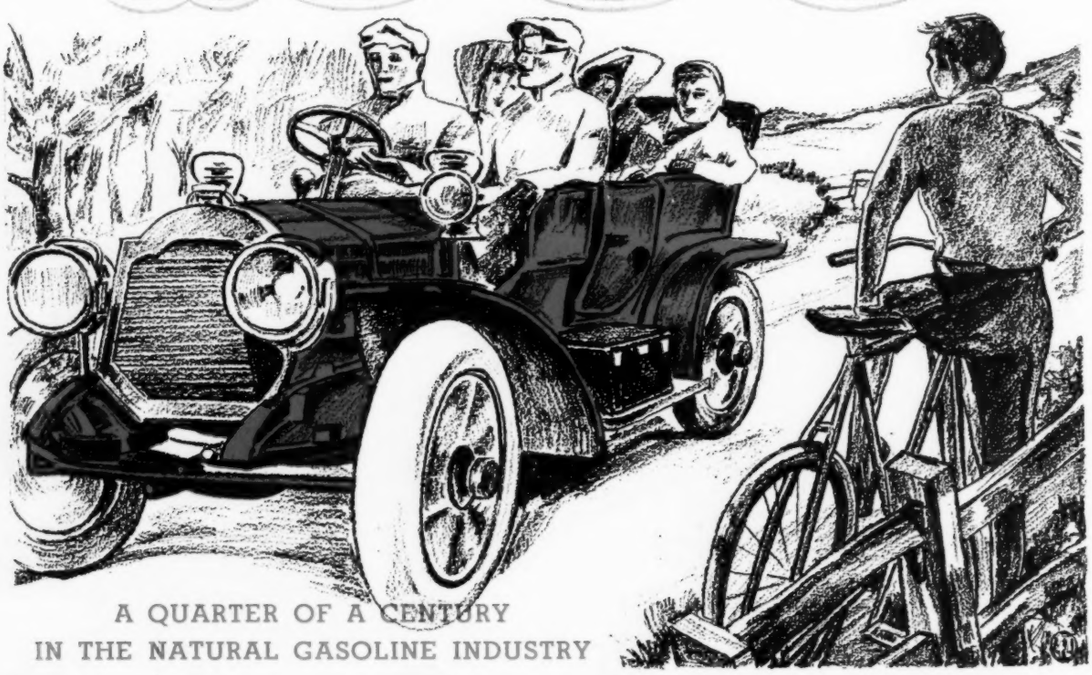
STABILITY ◆ VOLATILITY ◆ ENERGY

IT'S A "NATURAL"

PRODUCT OF EXPERIENCE THAT BEGAN

1903

WITH THE *Linen Duster* DAYS OF THE AUTOMOBILE



A QUARTER OF A CENTURY
IN THE NATURAL GASOLINE INDUSTRY

Hanlon-Buchanan, Inc

PIONEER NATURAL GASOLINE MANUFACTURER

EXPORT TERMINALS:
Goodhope, La.
Houston, Tex.

TULSA, OKLAHOMA
NATIONAL BANK OF TULSA BUILDING
PHONE 4-1101 or L.D. 398 WIRE—OR WRITE P.O. BOX 1559
Cable Address . . . STAVOLENE, Tulsa, U. S. A.

FOREIGN REPRESENTATIVE:
Borax, Williams & Co., Ltd.
4 Lloyd's Ave.
London, England

AUGUST
1936

WORLD PETROLEUM

VOLUME VII — **Editor, E. W. Mayo** — NUMBER 8

CONTENTS

Frontispiece 386

Editorial 387

Foreign Oil Legion 391

Abstracts 404

Production 414

Special Articles

U. S. Tanker Construction Near Peace Time Peak 389

Operation of Manchukuo's Petroleum Monopoly 390

Celebration of Sir Henri Deterding's 40 Years With Royal Dutch 391

Deep Well Drilling — Will it Prove Profitable? 392

Near East — New Strategic Oil Centre 395

Map of Near Eastern Oil Operations 400

Published Monthly by

RUSSELL PALMER

56 West 45th Street, New York, U. S. A.

Cable Address, Ruspam, New York and London

Advertising Manager, S. J. Gallay

Executive-Editor, T. Orchard Lisle

London: 3 Savoy Place, Victoria Embankment, W. C. 2

▼

OFFICES: Bendix Bldg., Los Angeles, Calif.
58 Sutter St., San Francisco, Calif.
Gulf Bldg., Houston, Texas.

Subscriptions

ANNUAL subscription to WORLD PETROLEUM is offered at the flat rate of five dollars (U. S.) postpaid to any country in the International Postal Union.

For the convenience of subscribers the publisher will accept payment in any of the following currencies at the fixed rate shown below:

Argentina	15 paper dollars
Canada	5.00 dollars
Colombia	8.55 pesos
France	75 francs
Germany	13 reichsmark
Great Britain	1 guinea
Holland	7 guilders
India	13 rupees
Iraq	1 guinea
Italy	62 lire
Japan	17 yen
Mexico	18 pesos
Iran	1 guinea
Peru	20 sol
Poland	26 zloty
Roumania	654 lei
Russia	6 roubles
Venezuela	19 bolivar

Remittances or drafts should be drawn to the order of the Publisher, WORLD PETROLEUM, payable in New York and London.

Subscriber's name and address should be in Roman capitals on the subscription order.

Official position of subscriber is requested.

Advance notice, if possible, of a change of subscriber's address should be given.

▼

Agencies

SINGLE copies of WORLD PETROLEUM are obtainable every month, within the delay imposed by the international mail service, at any of the following agencies:

CABIMAS, VENEZUELA—The German Store
CARACAS, VENEZUELA—Casa Letcher, Torres a Madrices 22
MARACAIBO, VENEZUELA—High Life Tailors
THE HAGUE—Martinus Nijhoff, Lange Voorhout 9
LONDON—World Petroleum, 3 Savoy Pl., Victoria Embankment, W. C. 2, telephone: Temple Bar 1735
A. C. Hardy, 110 Fenchurch St., E. C. 3
W. H. Smith & Sons, Ltd., Moorgate Met. Station
Willing & Co., Ltd., Moorgate Met. Station
Barker & Howard, 6 Fenchurch Buildings, E. C. 3
NEW YORK—Telephone VAnderbilt 3-1095 for list of 20 newsstands carrying copies
WASHINGTON—Don J. Kirkley, 1633 L Street
PARIS—Librairie Brentano, 37 Avenue de l'Opéra
PORT OF SPAIN, TRINIDAD—Davidson & Todd, Ltd., 8 Frederick St.
LOS ANGELES—Bendix Bldg., telephone: Prospect 9191
SAN FRANCISCO—58 Sutter Street, telephone: Exbrook 4855

The price of a single copy is 2 shillings in countries of the British Commonwealth and the equivalent of 50 cents (U. S.) elsewhere.

▼

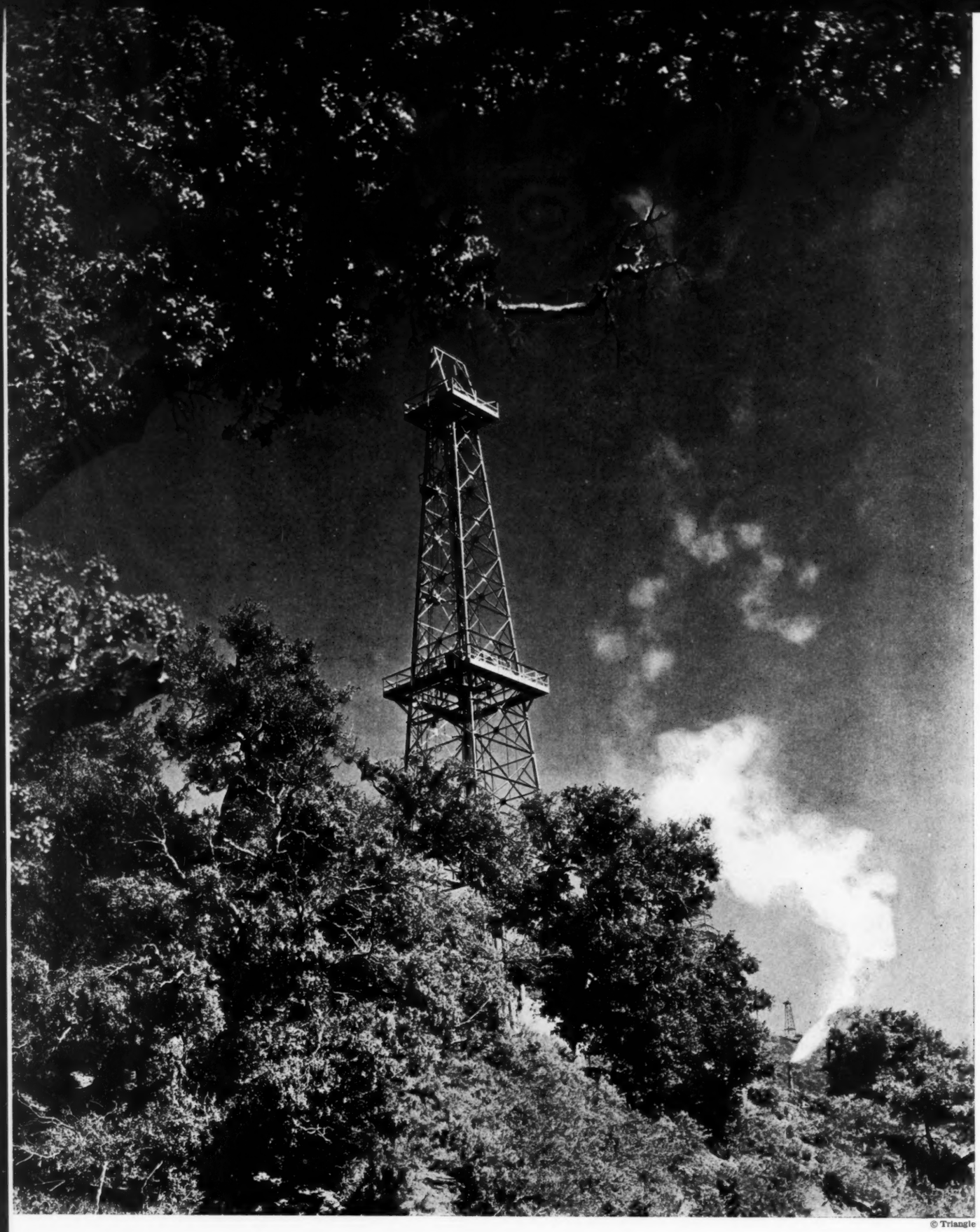
Particular Notices

CONTENTS of WORLD PETROLEUM are copyrighted by Russell Palmer, and contents may not be reproduced without permission.

Manuscripts and photographs submitted to the editor are received only at the owner's risk. Prompt consideration will be given to them.

The Publisher does not necessarily endorse the views expressed by authors of signed articles. In the service of readers he will not hesitate to give publication to signed opinions in direct opposition to his own.

Advertising rates obtainable on request.



© Triangle

California Hillside

NEW YORK • WORLD • LONDON

PETROLEUM

Crude Price Responsibility

EARLIER in the season and directly following the price-crisis in Rodessa, the general feeling prevailed in well informed circles that crude prices in America were safe until fall. Exceptionally heavy demand through the summer, it was felt, would adequately counterbalance an admittedly high rate of production. But, with seasonal slackening of demand toward the end of the year, the question of first importance is whether the rate of production can be checked sufficiently to maintain prices. Judging by previous experience the answer is that it probably cannot.

There is, however, another means by which prices may be supported if production does not too far outrun current needs. The major companies might continue to acquire surplus crude and gasoline and release it on the market in an orderly manner that would not be detrimental to the present price structure. This is, in fact, the way in which other crises in production have been met and is the method by which prices have been maintained in the immediate past.

In doing this the major companies repeatedly have sacrificed immediate financial advantage for the good of the industry. Most of them are at all times large purchasers of crude. With less readily available crude in sight now than at any time since 1926, the most profitable policy for the major companies might well be to make no effort to support crude prices, but instead to take advantage of a price break to replenish depleted inventories while checking their own production, and wait for next spring or summer when seasonal increase in demand would again advance prices to their present or higher levels. As a business manoeuvre the possibilities of such a course are too obvious to escape notice.

On the other hand, from a long range view, the major companies have much to gain from market stability, both in crude and finished products. The desire to promote such stability has led them in the past to support the crude price structure by extensive buying, even at some temporary disadvantage. There is of course a limit beyond which such procedure becomes impracticable.

Unless there is a radical change, which on the basis of present facts and the past record can hardly be anticipated, the maintenance of the crude oil price structure will depend entirely on the policy of the major integrated oil companies. Will they act from a strictly profit-motive, solely in the interest of their stockholders? In that case crude prices are almost sure to break. Or will they, as in the past, assume the burden of carrying surplus output for the good of the petroleum industry as a whole?

While the injustice of placing responsibility for price maintenance on the major integrated companies is not to be denied, the fact is that circumstances have so placed it. Their response will be reflected in the course of crude prices between now and the end of the year.

▼

Oil Code Completed

UNREMITTING labor on the part of the committee in charge, extending almost steadily from the dissolution of the NRA, has resulted in the formulation of a code of fair practice for the petroleum industry of the United States and on July 21 it was filed with the Federal Trade Commission. Strictly speaking the code as offered applies only to the states east of the Rocky Mountains for the reason that Pacific Coast marketers are operating at present, apparently with fair success, under an agreement of their own. If, however, the code recently completed is accepted by the Washington authorities, and is put into effect, it presumably will be made to cover the whole country.

Whatever may be the merits or demerits of the attempt to apply uniform rules of practice to an industry containing as many thousands of individual sales units as does the petroleum trade it can be said of the document now in the hands of the Federal Trade Commission that a vast amount of earnest work has entered into its preparation. Members of the sub-committee of the national committee, Messrs. Arnott, Hadlick and Schuh, have taken part in hundreds of meetings and conferences in different parts of the country at which marketers of every class and size have been invited to present their views and suggestions. National and local marketing associations and individuals not identified with any organization have had opportunity to discuss the provisions of the code and to suggest changes. In its final form its submission to Washington has been approved by wholesale and retail organizations and by the American Petroleum Institute. It should reflect the opinion of the industry as nearly as any single document could.

Before the Federal Trade Commission passes upon the code it will hold public hearings at which supporters and objectors will have a further chance to air their views. If thereafter the Commission approves its form and contents it will then go back to the marketers for their acceptance or rejection. Should it receive the approval of a great majority it cannot afterward be alleged

that it was "put over" on the industry, or that there was a lack of full and free consideration. The test as to whether the petroleum industry can regulate its sales operations by a voluntary charter acceptable to governmental officials will have been made. Whether the ultimate result is success or failure the experience will have been an instructive one by directing the attention of the whole industry to those practices widely recognized as unethical, as distinguished from those that are merely illegal.

▼

Sharing Progress

OF ALL the charges made against the oil industry the most footless is the claim that large companies utilize the possession of patents which they have acquired by purchase or through their own research to "coerce" their smaller competitors. A resolution to investigate this patent control was introduced in the Congress of the United States early in 1935 but in the absence of any support for the charges it contained it failed to receive any action.

Recently a public speaker whose name is widely known made the statement that one of the largest oil companies in the United States had entered into an agreement with foreign interests to control the Bergius patents relating to coal hydrogenation for the purpose of preventing their utilization in America. The mere consideration that the truth is exactly the opposite of this carries no weight with agitators who are interested simply in stirring up antagonism to the oil industry but for the sake of the record it may be worth while to call attention to the reality.

Perhaps no other important industry has a record of such liberality as petroleum in the matter of making available to all its members the results of progress and experiment by any one of them. This has been true not only of inventions originated by the oil companies themselves but also of patents and processes acquired from other parts of the world.

When it was demonstrated for example that the methods of producing gasoline and other products from coal developed by Dr. Bergius in Germany held possibilities of future importance for the oil industry, although not an immediate factor in the situation as it existed in the United States, Standard Oil Co. (New Jersey) immediately took steps to insure that these should be made available on this side of the Atlantic. It purchased the rights to the use of the patents in all countries outside of Germany not for the purpose of suppressing the use of these patents but to make them widely available.

Rights for the United States were transferred to the Hydro Patents Company. All refineries having a daily capacity of 20,000 bbl. or more were invited to share in their ownership. Some eighteen such companies now participate in the ownership of the patents and there is no barrier to the admission of others to equal participation.

▼

Consumers Benefit

IT IS OBVIOUS that the major oil companies are in a better position to maintain expensive research than are those whose operations are conducted on a small scale. Nevertheless it is true that every important advance in the manufacture of petroleum products has been put before all companies in the industry on equal and extremely reasonable terms. The greatest advances that have been made in the manufacture of petroleum products have been recorded in the art of cracking. A large number of patents have been issued covering one or another phase of cracking. The majority of these have been placed in the hands of companies controlled by no one group of interests and are open to use by any reputable refiner. As a result any man who wants to build a refinery can take advantage of the latest developments in cracking at a cost which is only a tithe of the amount actually expended in perfecting these processes.

The same thing is true of the many improvements made in the past few years in solvent refining and of the latest innovation—polymerization. Only a few weeks ago President Howard of the Standard Oil Development Company announced that his company had developed a means of recovering iso-propyl ether from refinery gases with the consequence that a new and superior aviation fuel of better than 100 octane would soon be available in quantity. Coupled with the announcement was the statement that use of the process would be put at the disposal of any company that desired to take it up.

When the Ethyl Gasoline Corporation first put its high test motor fuel on the market a small royalty was charged to companies selling it. As demand expanded, however, this royalty charge was dropped and the corporation since has depended for profit upon the sales of its product.

The remarkable record that has been made in cheapening the cost of motor fuel and other petroleum products has been due to the improvements in manufacturing processes and to the fact that these improvements have been quickly and widely brought into use by all the progressive members of the industry. Without cracking, for example, or if cracking had been held as a monopoly by any one company, gasoline today would be selling at double or triple its present cost. It is but simple justice to record the fact that the millions upon millions spent in petroleum research and development have been shared on most liberal terms among the members of the industry and have been extended in the same measure to the users of their products.

▼

Roumanian Problems

ING. C. OSICEANU, President of the Association of Petroleum Industrialists of Roumania, has set forth in a pamphlet recently published in the Roumanian language, some interesting observations on the world situation of combustible liquids and the particular problems of the oil industry in his own country. In connection with the first of these subjects he notes the improvement that has taken place in conditions, particularly in the United States, but reasserts his belief in the desirability of an international oil agreement, remarking on this point "It will become necessary—we may say that it will become indispensable—in the future to regulate world production at the level of world consumption."

Mr. Osiceanu comments on the mounting burden of taxation that threatens the stability of the oil industry and urges the adoption of measures to facilitate the exchange of money between various countries as a means of removing a serious impediment to world trade. He points out the importance of maintaining large underground reserves and criticizes the tendency of non-producing countries to create their own refining industries as reacting to the detriment of their internal economy.

Dealing with the Roumanian situation, Mr. Osiceanu directs attention to the remarkable record of the oil producers in increasing the efficiency and economy of their operations, but shows that the industry is seriously handicapped by two factors. One of these is the heavy taxation which has increased since 1928 from 28 to 84 percent of the internal price. The other is the high rates paid for the transport of oil to Constantza in the absence of the long-promised pipe line. At the present time the freight rate from Constantza to London is less than the railway freight from Ploesti to Constantza.

Peace Time Peak in U. S. Tanker Construction

Jersey Standard's Order for Eight Tankers Involving an Expenditure of Over $13,000,000 Brings Total to Twenty-One Tankers Now Under Construction in U. S. Shipyards.

AN UNUSUAL amount of tanker construction in United States shipyards was further emphasized during July by the announcement that Standard Oil Company of New Jersey had placed orders for a total of eight tankers to be constructed in U. S. shipyards. This order, added to those which are presently being executed, makes a total of 21 tankers building in the United States for coastwise trade. The Jersey Standard order was the largest shipbuilding order ever placed by a private concern in this country.

The eight tankers for the Jersey Standard will cost over $13,000,000 and will furnish some 7,000,000 hours of labor. Four of the tankers are to be built by Federal Shipbuilding and Dry Dock Company at Kearny, N. J. These tankers are being constructed on the Isherwood Arcform hull design with longitudinal hull framing, with a deadweight tonnage of 12,800. They will be almost exactly similar to the SS. R. P. RESOR and T. C. MCCOBB recently delivered to Standard Oil Company of New Jersey by Federal Shipbuilding.

Two of the remaining four Jersey Standard tankers included in the July order, will be constructed by Bethlehem Shipbuilding Corporation at Sparrows Point, Md. The tankers will be 13,000 deadweight tons each with a Frear-Bethlehem hull design and special fluted plating bulkheads now used for the first time.

The remaining two tankers ordered for the Jersey Standard will be constructed by the Sun Shipbuilding and Dry Dock Company at Chester, Pa. These two tankers will be 12,900 deadweight tons each, constructed on the Isherwood Arcform hull design and Isherwood Bracketless hull construction. Delivery is scheduled for September 1937 and February 1938.

All of these tankers will have a loaded sea speed of 12 knots driven by a single screw and high pressure steam turbines operating through a double reduction gear. All the tankers will use water tube type boilers.

At a luncheon following the signing of the order, Mr. Robert L. Hague, general manager of the marine department of Standard Oil Company of New Jersey stated among other things that his company's tanker program was far from completed and that more orders would be forthcoming in the near future.

These eight tankers will replace a somewhat larger number of Jersey Standard coastwise tanker that are approaching obsolescence. They also illustrate the tendency of tanker operators to seek higher speeds, as the loaded sea speed of 12 knots is some two knots higher than average speed of tankers in this service. Mr. Hague stated that further large orders would be necessary in future as a number of his company's coastwise tankers were approaching an age that the company had determined rendered their further operation uneconomic.

Of the other 13 tankers now under construction in the United States two are being constructed for Socony-Vacuum Oil Company, four for the Gulf Oil Corporation, four for Pan American Petroleum and Transport Company and one each for Atlantic Refining, The Texas Corporation, and Sun Oil Company.

Both tankers now under construction for Socony-Vacuum are being built at Chester, Pa. by Sun Shipbuilding. They will be 501 ft. o.a., by 68 ft. molded beam, by molded depth of 37 ft. with a total deadweight capacity of 15,400 tons. Hulls are being built to the standard Isherwood Bracketless system. Both tankers are single screw steam turbine units with water tube steam generators and a double reduction gear driving the tankers at 13 knots loaded sea speed. It is expected that these tankers will be delivered in November 1936 and January 1937.

The Texas Company has one tanker under construction at the Sun Shipbuilding yard at Chester. This tanker, for use in coastwise trade, will be 465 ft. o.a. with a beam of 65 ft. and a molded depth of 34.6 ft. propelled by Diesel power. It is expected that this ship will be completed about August 1937.

Sun Shipbuilding also has under construction a steam driven tanker of 11,400 tons for the Atlantic Refining Company for use in coastwise trade. The principal dimensions of this ship are, length, 520 ft. o.a., beam 70 ft., molded depth 40 ft. Delivery date on this tanker is placed at October 1937.

The Gulf Oil Corporation has placed orders for four tankers, two of which are now under construction at the yard of the Bethlehem Shipbuilding and two are being constructed at the yard of the Sun Shipbuilding Co.

Sun Shipbuilding are constructing a 9,800 ton Diesel driven tanker for the Sun Oil Company to be completed in December 1936. This tanker will be 511 ft. o.a., 65 ft. beam by 37 ft. molded depth.

Pan American Petroleum and Transport has four tankers on order, two of which are being built by Federal Shipbuilding Company and two by Sun Shipbuilding. The two tankers being built by Federal for Pan American are designed for a carrying capacity of approximately 100,000 bbl. of clean oils. They are to be turbine driven with a deadweight tonnage of 12,800. The principal dimensions are length o.a. 435 ft., beam 66 ft. and molded depth 34.6 ft. These tankers are scheduled for delivery in November and December of this year. The two Pan American tankers under construction at the yard of Sun Shipbuilding are scheduled for delivery in October and November of this year. These are also turbine driven tankers of 484 ft. o.a. by 68 ft. beam by 37 ft. depth.

This completes the list of 21 tankers now under construction in U. S. shipyards for U. S. oil companies. It is of interest to note that these orders probably mark only a beginning of tanker construction activity in the United States as obsolescence of coastwise tanker fleets clearly indicates that further construction is not only economically advisable, but is rapidly becoming imperative. The present orders, however, bring tanker construction activity to its peace time peak.

Operation of Manchukuo's Oil Monopoly

Government Monopoly of Petroleum Sales in New State Has Been in Force For 15 Months — Large Stocks Held by International Companies Effect Sales During Initial Period. *By Morio Otaki*

THE government petroleum monopoly in Manchukuo, viewed with some apprehension by international oil companies, has now been in effect since April, 1935. How has this new law affected those companies operating in Manchukuo? An examination of the organization and sales of the monopoly during the past fifteen months would appear to be in order at this time.

An extract of the Oil Monopoly Law of Manchukuo, promulgated November 14,1934, as Ordinance No. 149 and enforced April 1, 1935, is given below.

ARTICLE I. The word "oil" as used in the present law includes gasoline, kerosene, gas-oil, heavy oil, benzol and fuel oil substitutes.

ARTICLE II. The sale of oil shall be a government monopoly.

ARTICLE III. The manufacture, refining, importation and exportation of oil shall not be allowed except by those who have obtained permission from the government.

ARTICLE IV. Oil which has been manufactured, refined or imported by permission of the government shall be purchased by the government.

ARTICLE V. The sale and distribution of oil shall be conducted by oil dealers designated by the government. Depending upon special circumstances, however, the sale of oil to consumers by the government itself shall not be obstructed.

ARTICLE VI. The government, when it deems necessary, may order any oil dealer appointed by it to keep a certain designated supply of oil in stock.

ARTICLE VII. The manufacture, importation and exportation of mineral oils (other than oil as defined in Art. I) shall not be allowed except by those who have obtained permission from the government.

ARTICLE VIII. The government, when it deems necessary, may order any person engaged in the handling of oil or (mineral oils) mentioned in the foregoing article to make a report to the government or to effect improvements in his equipment, etc.

ARTICLE IX. The competent officials, when they deem necessary, may enter any factory or any place for storage of oil or (mineral oils mentioned in Article VII), or any shop of any oil dealer designated by the government or any other place, and may inspect oil or (mineral oils) accounts, documents and other objects.

(Articles X–XX provide penalties for violations of the foregoing law.)

GOVERNMENT monopoly of the sale of petroleum products in Manchukuo, placed in operation in April, 1935, as the first step of the concrete liquid fuel policy of the new state, has been in operation now a little over one year. By the provisions of the Oil Monopoly Law of Manchukuo, promulgated in November, 1934, and enforced April, 1935, the country has been divided into ten sales territories, in each of which has been established a government sales office where petroleum products are stored and sold. Those sales offices are located in principal cities of the various sales territories.

To each of these petroleum monopoly bureaus is assigned one general wholesaler, with headquarters wherever the bureau is located and a number of branches in different parts of the sales territory controlled by that monopoly bureau.

Such general wholesalers are, without exception, joint stock companies or unlimited partnerships controlled by the Commercial Law of Manchukuo.

Shareholders and members of the staffs are the wholesalers who, prior to the promulgation of the Petroleum Monopoly Law, were engaged in large-scale wholesale distribution of petroleum products in the districts where monopoly bureaus are now located; in other words, the sixteen principal oil distributing centers. These former oil dealers are allowed to become general wholesalers regardless of their nationalities. Under the general wholesalers are ordinary wholesalers who number about 300 throughout Manchukuo. A large number of the ordinary wholesalers are those who were formerly engaged in the wholesale or retail trade of petroleum products in different provinces of Manchuria. As in the past, they receive their supplies from the general wholesalers.

As in the case of general wholesalers, ordinary wholesalers are allowed to engage in petroleum sales activities under the monopoly system of Manchukuo irrespective of their nationalities.

Petroleum products sold in Manchukuo under the monopoly system are largely the products of the Manchu Petroleum Company, Ltd., refined from imported crude oils. Fushun products and imports from Japan follow in quantity. Sales of petroleum products in the South Manchurian Railway Zone, under Japanese administration, are not controlled by the monopoly system.

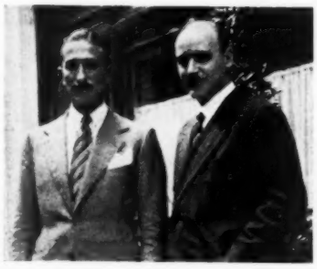
*** Manchukuo Petroleum Monopoly Sales—1935**

QUANTITY IN CASES OF 9.75 GALLONS EACH. VALUE IN YEN

Month		Gasoline	Kerosene	Light Oil	Heavy Oil	Benzole	Total
April	Quantity	11,072	9,837	468	193	....	21,570
	Value	88,881	70,978	2,305	683	....	162,848
May	Quantity	38,715	19,372	2,220	3,623	322	64,252
	Value	256,988	135,289	11,234	11,734	2,138	417,384
June	Quantity	73,298	10,554	2,231	7,690	....	93,773
	Value	474,277	72,228	10,803	21,427	....	478,736
July	Quantity	91,241	9,139	3,653	8,311	1,871	114,217
	Value	578,731	59,995	17,076	24,294	11,652	691,749
Aug.	Quantity	92,987	12,741	8,816	6,612	1,043	122,200
	Value	625,851	85,589	42,334	19,575	7,424	780,774
Sept.	Quantity	102,051	69,459	22,744	14,004	4,988	213,247
	Value	667,610	520,076	114,743	41,749	33,908	1,378,088
Oct.	Quantity	94,617	63,140	40,866	6,775	4,943	210,342
	Value	681,643	443,098	200,700	16,501	31,884	1,373,829
Nov.	Quantity	102,698	86,674	57,273	13,516	655	260,816
	Value	698,633	612,259	285,842	31,916	4,387	1,633,040
Dec.	Quantity	146,381	122,189	61,608	13,104	455	343,738
	Value	929,381	865,833	303,094	36,494	3,007	2,137,711
Total	Quantity	753,061	403,108	199,881	73,829	14,278	1,444,158
	Value	5,001,997	2,865,349	988,135	204,276	94,304	9,154,163

* Sales in Manchukuo since operation of Petroleum Monopoly Law, April, 1935.

Foreign Oil Legion



Dr. Mariani and Marchese Patrizi

MARCHESE Giovanni Patrizi and Dr. Mariani, representing the Italian Government controlled oil company, Azienda Generale Italiana Petroli, on the board of Mosul Oil Fields Ltd., visited London during July in connection with business of the Mosul company.

NORTHROP CLAREY'S appointment to the post of assistant to the president of Standard Oil Company of New Jersey was announced in July by W. S. Farish, chairman of the board. Mr. Clarey joined Jersey Standard from the advertising department of the National City Bank of New York in 1919. Prior to that he was for several years in the editorial department of THE WALL STREET JOURNAL and was later financial editor of THE NEW YORK TIMES.

G. L. KOTHNY of the Sperry-Sun Well Surveying Company of Philadelphia, accompanied by Mrs. Kothny will sail from New York for Europe on the ss. DEUTSCHLAND on August 13th. Mr. Kothny is combining a vacation with business in Europe.

I. FRANK BROWN, well known in South America, Europe, Russia and the Far East, has recently moved to New York where he will represent several well known oil equipment firms. Mr. Brown drilled one of the first wells at Signal Hill, California and helped introduce rotary drilling in Miri Sariwak.

© Blank & Stoller

Mr. I. Frank Brown

ON WEDNESDAY, July 22, at the Dorchester Hotel, London, a large gathering of executives of the Vacuum Oil Company, Ltd., celebrated the completion of 35 years' service by Mr. Hubert Holliday, Managing Director of Vacuum, Ltd.

Mr. Hubert Holliday

ATTENDING the celebration at The Hague of his forty years' connection with the Royal Dutch organization Sir Henri Deterding took occasion to deny the rumor that he was about to retire from business and settle down. If he were less modest he might well have answered the report by asking, "Why should I?" If there is a younger man at seventy than Sir Henri it would be hard to find him and the idea that his exceptional ability, fortified as it now is by forty years of experience, should be withdrawn from the service of his company is an illogical one. It is no secret that on three occasions Sir Henri has offered to step down from his chairmanship but each time has been prevented by the unanimous objection of his associates.

Sir Henri Deterding, sixth from the left, listening to Mr. Sluyterman van Loo's speech at The Hague.

Deep Drilling—Will It Prove Profitable?

Although Tremendous Strides Have Been Made In Drilling Technique and Equipment, Experience Shows the Deepest Wells to Be the Most Costly and Least Productive.

By Frank Hill
Union Oil Co.

IN taking up the subject of deep drilling, a short review of some historical data may be in order.

The writer's experience in the oil industry began in 1895. At that time 1,200-ft. wells were considered deep.

In 1900, near what is now Western Avenue and Wilshire Blvd., Los Angeles, California, I drilled on well No. 1 of the Pellissier Oil Company, an affiliate of Union Oil Company. The well was drilled approximately 2,800 ft. with standard tools and was considered (at least by the crew) a record depth for that time.

In 1909, Union Oil Company, through another affiliate, the Pitcher and Garbutt Oil Company, drilled Brashear No. 1 in Salt Lake Field, California, to a depth of 5,660 ft. with standard tools—a California record of that date.

In 1924, the Standard Oil Company drilled Brownrigg Keller at Santa Fe Springs, California, to 7,212 ft., establishing a new record (this was with rotary tools).

In 1924, Union Oil Company drilled its Gardena No. 1 in the Dominguez Field to a depth of 7,319 ft., another record.

In 1925, E. J. Miley reached a depth of 7,591 ft. in his Athens well No. 6 in the Athens area, Rosecrans Field, California, for another record. This was the deepest producing well at that time.

In 1926, the C.C.M.O. at Olinda, California, drilled its well No. 96 to 8,201 ft.

In 1929, the Shell Company drilled its Nesa No. 11 in the Long Beach field to a depth of 9,211 ft.

In 1931, the C.C.M.O. again set up a record on its Hobson No. A-2 at Rincon, California, and drilled it to 10,030 ft.

In 1932, the Western Gulf drilled their Bradley No. 1 near Santa Maria, California, to a depth of 10,299 ft.

In 1934, the North Kettleman Oil & Gas Company drilled their Lillis & Welch No. 1 to a depth of 10,944 ft.

In 1934, the General Petroleum on its Barry No. 1 in Belridge, California, reached a depth of 11,377 ft.

The above records are of California wells as we know them. It is also a matter of record that in 1931 the Penn-Mex in the Tuxpan District, Mexico, drilled a well to 11,570 ft., while the all time record was made in 1935 by the Gulf Production Company of Texas in the

Lillis-Welsh No. 1 at Kettleman Hills, California, which went down to 11,147 ft.

GRAPHIC WELL HISTORY

NORTH KETTLEMAN OIL & GAS COMPANY

LILLIS & WELSH WELL NO. 1

UNION OIL CO. FIELD DEP'T.- LOS ANGELES, CALIF.

Description of work done by Mr. Ed McAdams:

Spud in (4-12-32), 18⅝" cem. at 1087' (4-20-32); 11¾" cem. at 6710' (6-20-32); sdtk. 46' of 4½" D.P. & bit from 9397'-9443' (11-2-32); 7" cem. at 9642' (1-17-33); pieces shoe guide and formation tester lost and milled at 9851'-9935' (2-27-33); stuck 3" D.P. incl. Hughes bit at 10,944', shot at 10,924' (5-24-33); second nitro-glycerin shot went off prematurely at 9638' (5-27-33); recovered 3" D.P. to 9655' (6-10-33); lost at 9880' one joint of 2½" R.H. D.P. (9-16-33); milled at 9912'-9935' (10-18-33); found top of 3" D.P. at 9680' (10-30-33); found hole in 7" csg. at 9455'-9619' and twisted off Reed bit and reamer-top fish at 9637' (11-9-33); sdtk. and redrilled from 9717'-9890'; new hole from 9789' (11-16-33); lost 5⅝" Hughes 3 cone bit at 10,130' (12-13-33); redrilled to 10,336', old fish fell in hole at 9720' (1-3-34); set 248' whipstock, top at 9705' (1-25-34); redrilled to 9898'; old sdtk D.P. bothered (1-28-34); plug. w/cem. to 9648' and suspended (2-4-34).

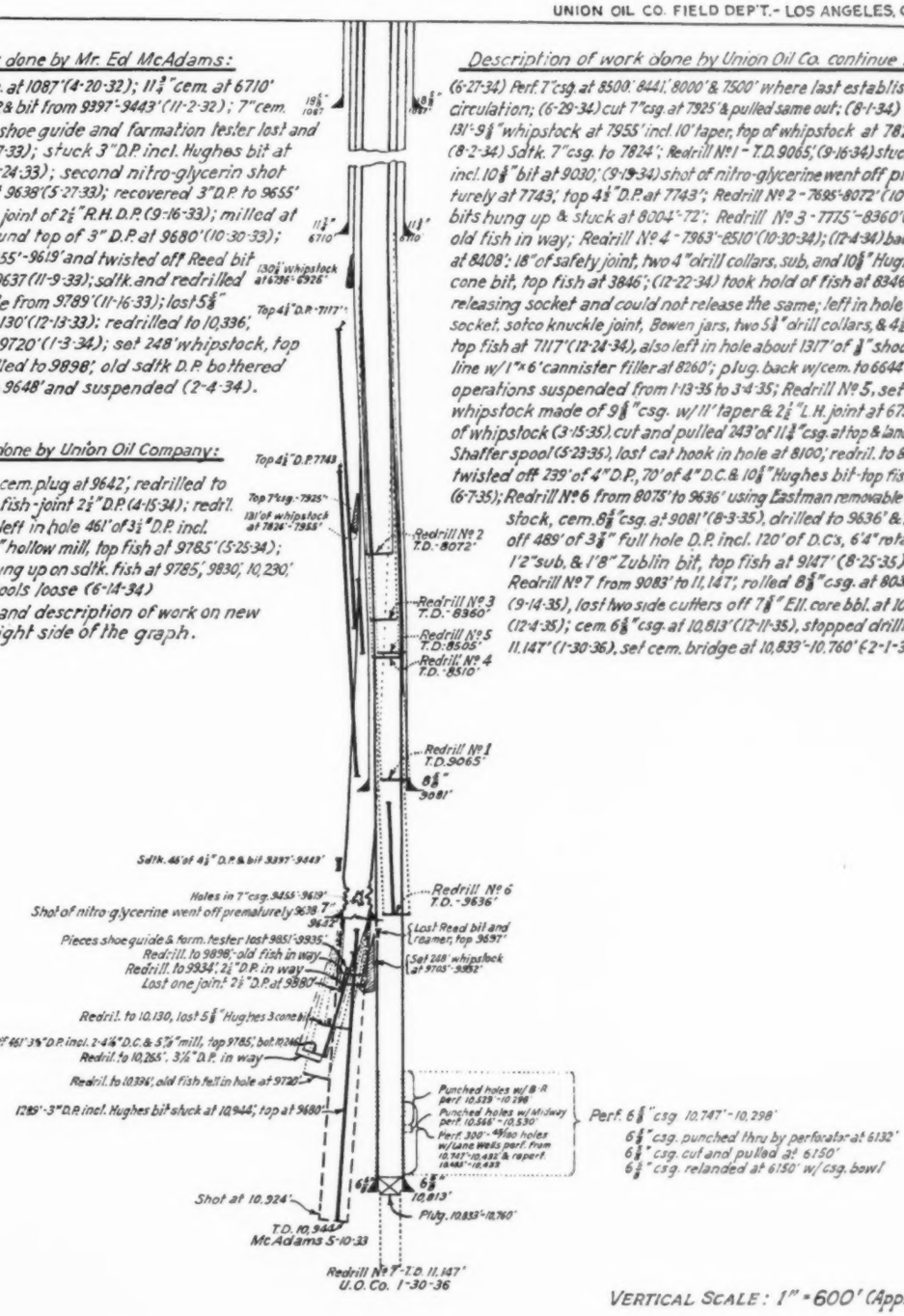
Description of work done by Union Oil Company:

Work started: 4-11-34; top cem. plug at 9642', redrilled to 9934', bit stopped on old fish-joint 2½" D.P. (4-15-34); redr'l. to 10,246', twisted off and left in hole 461' of 3½" D.P. incl. two 4¼" O.D. D.C's. and 5⅞" hollow mill, top fish at 9785' (5-25-34); redrilled to 10,265', bits hung up on sdtk. fish at 9785', 9830', 10,290', and 10,245'. Had to jar tools loose (6-14-34)

Note: Continuation and description of work on new hole is shown on the right side of the graph.

Description of work done by Union Oil Co. continue:

(6-27-34) Perf. 7" csg. at 8500', 8441', 8000' & 7500' where last established circulation; (6-29-34) cut 7" csg. at 7925' & pulled same out; (8-1-34) set 131'-9⅝" whipstock at 7955' incl. 10' taper, top of whipstock at 7824'; (8-2-34) Sdtk. 7" csg. to 7824'; Redrill No. 1 - T.D. 9065', (9-16-34) stuck 4" D.P. incl. 10⅝" bit at 9030', (9-19-34) shot of nitro-glycerine went off prematurely at 7743', top 4½" D.P. at 7743'; Redrill No. 2 - 7695'-8072' (10-2-34), bits hung up & stuck at 8004'-72'; Redrill No. 3 - 7775'-8360' (10-9-34) old fish in way; Rearill No. 4 - 7963'-8510' (10-30-34); (12-4-34) backed off at 8408'; 18" of safety joint, two 4" drill collars, sub, and 10⅝" Hughes 3 cone bit, top fish at 3846'; (12-22-34) took hold of fish at 8346 w/Bowen releasing socket and could not release the same; left in hole Bowen socket, sotco knuckle joint, Bowen jars, two 5½" drill collars, & 4½" D.P., top fish at 7117' (12-24-34), also left in hole about 1317' of ⅜" shooting line w/1" x 6' cannister filler at 8260'; plug. back w/cem. to 6644' (1-10-35) operations suspended from 1-13-35 to 3-4-35; Redrill No. 5, set 130½' whipstock made of 9⅝" csg. w/11" taper & 2½" L.H. joint at 6796'-top of whipstock (3-15-35), cut and pulled 243' of 11¾" csg. at top & landed in Shaffer spool (5-23-35), lost cat hook in hole at 8100'; redril. to 8504' and twisted off 239' of 4" D.P., 70' of 4" D.C. & 10⅝" Hughes bit-top fish at 8134 (6-7-35); Redrill No. 6 from 8075' to 9636' using Eastman removable whipstock, cem. 6⅝" csg. at 9081' (8-3-35), drilled to 9636' & twisted off 489' of 3½" full hole D.P. incl. 120' of D.C's, 6'4" rotary jars, 1'2" sub, & 1'8" Zublin bit, top fish at 9147' (8-25-35); Redrill No. 7 from 9083' to 11,147', rolled 8⅝" csg. at 8035'-61' (9-14-35), lost two side cutters off 7⅞" Ell. core bbl. at 10,813' (12-4-35); cem. 6⅝" csg. at 10,813' (12-11-35), stopped drilling at 11,147' (1-30-36), set cem. bridge at 10,833'-10,760' (2-1-36.)


19⅝" 1087'
11¾" 6710'
130½' whipstock at 6796'-6926'
Top 4½" D.P.-7117'
Top 4½" D.P. 7743'
Top 7" csg.-7925'
131' of whipstock at 7824'-7955'
Redrill No. 2 T.D.-8072'
Redrill No. 3 T.D.-8360'
Redrill No. 5 T.D. 8505'
Redrill No. 4 T.D.-8510'
Redrill No. 1 T.D. 9065'
6⅝" 9081'
Sdtk. 46' of 4½" D.P. & bit 9397'-9443'
Holes in 7" csg. 9455'-9619'
Shot of nitro glycerine went off prematurely 9638'
7" 9642'
Redrill No. 6 T.D.-9636'
Lost Reed bit and reamer, top 9697'
Set 248' whipstock at 9705'-9952'
Pieces shoe guide & form. tester lost 9851'-9935'
Redrill. to 9898'; old fish in way
Redrill. to 9934'; 2½" D.P. in way
Lost one joint 2½" D.P. at 9880'
Redril. to 10,130, lost 5⅝" Hughes 3 cone bit
Redril. to 10,246'; twisted off 461' 3½" D.P. incl. 2-4¼" D.C. & 5⅞" mill, top 9785', bot. 10,246'
Redril. to 10,265', 3½" D.P. in way
Redril. to 10,336', old fish fell in hole at 9720'
12159'-3" D.P. incl. Hughes bit stuck at 10,944', top at 9680'
Punched holes w/ B.H. perf. 10,329'-10,298'
Punched holes w/ Midway perf. 10,346'-10,530'
Perf. 300'-4/90 holes w/Lane Wells perf. from 10,747'-10,482' & reperf. 10,448'-10,493'
Perf. 6⅝" csg. 10,747'-10,298'
6⅝" csg. punched thru by perforator at 6132'
6⅝" csg. cut and pulled at 6150'
6⅝" csg. relanded at 6150' w/ csg. bowl
6⅝" 10,813'
Plug. 10,833'-10,760'
Shot at 10,924'
T.D. 10,944' McAdams 5-10-33
Redrill No. 7 - T.D. 11,147' U.O. Co. 1-30-36

VERTICAL SCALE: 1" = 600' (Approx.)

Chart No. 2.

Probably the deepest oil production in the world—Lillis-Welsh No. 1 well. Left to right: F. F. Hill, the author, H. L. McCarty, gas supervisor, and F. C. Boyd, drilling superintendent.

McElroy Field, which was drilled to 12,786 ft.

It is clear from the foregoing that deep drilling is no new thing suddenly thrust upon us, but is rather a gradual development brought about by the coincidental development of better materials and improved drilling technique, and persons in many branches of the industry have aided by their contributions in bringing deep-well drilling to its present advanced stage. Perhaps the greatest single factor in this respect is the metallurgical advance, as without improved and strengthened equipment this deep drilling would not have been possible.

Drill pipe, tubing, and casing are now safely and successfully handled at depths twice that at which fifteen years ago they would have failed to support their own weight.

Modern drilling equipment could now easily be used at depths of 15,000 ft., if there were need for reaching such depths, but to date the deepest wells have been the most costly and the least productive.

The ingenuity and resourcefulness of man seems to be unlimited, and one can find many drillers, tool pushers, engineers and superintendents who are willing to pit their ability against the hazards of drilling if someone else pays the bills. Personally, I feel that for some geological reason (as yet unexplained) oil accumulation will not be found at extreme depths. If, however, 20,000-ft. drilling should become necessary, it could probably be done by rotary method, using alloys to lighten the per foot weight and to raise the tensile strength of drill pipe material. Hoisting, rotating, and cutting the hole is still easy so far as we have gone. Bits, reamers, core barrels, etc. have proved themselves capable of penetrating the hardest and most difficult formations known, thanks again to improved design, better materials, and the hard facing of earth cutting tools.

Much credit is due the American Petroleum Institute, founded in 1919, through whose activities standardization of oil field materials and interchangeability of products have been brought about. The Institute has also provided a clearing-house in which operators and manufacturers and their engineering and technical staffs can meet and work together for the technical advancement of the industry. With this aid, progress has been carried far beyond what might have been attained by individual effort.

Kettleman Hills offers an interesting subject for study. It always had the earmarks of a favorable structure, and as early as 1900 drilling was going on in this vicinity. Many times someone would try his luck but no one could reach a sufficient depth for a thorough test until the discovery of oil by the Milham Exploration Company in its Elliott No. 1 in 1928, when a producer was brought in at 7,236 ft. for 4,650 bbl. of 60 deg. gravity oil. The formation of Kettleman North Dome Association, composed of the majority of operators holding land on the North Dome, brought about a conservation and orderly development of the Kettleman Hills area, a fortunate circumstance since if an uncontrolled drilling stampede had been permitted to start there, enough cheap oil could have been produced from this field alone to have wrecked the Pacific Coast markets.

The accompanying chart No. 1, showing time and depth drilling curves, clearly shows the progress of drilling in the past years.

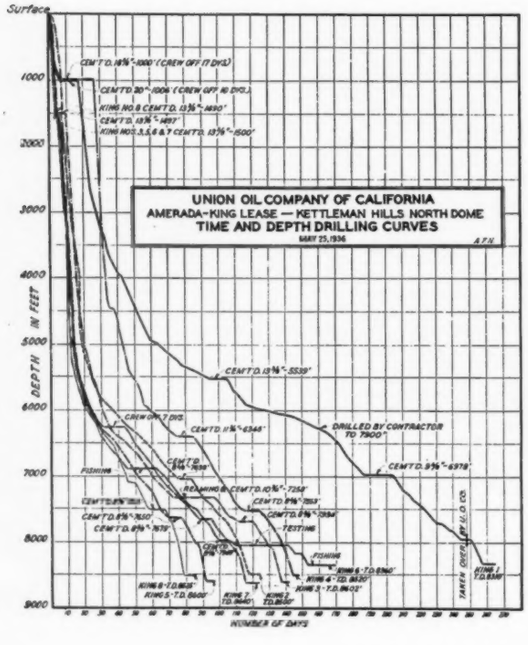
It has been reported that the Standard Oil Company and the Petroleum Securities Company drilled two wells on the Kettleman Middle Dome costing $1,000,000 each. I have not tried to verify these figures as they may be sore subjects to the company managements, and for the same reason no attempt will be made here to tell what the Union Oil Company and their associates have expended on the Lillis Welsh No. 1 at Kettleman. The graphic sketch No. 2 will give the reader some idea of the joy of drilling this kind of a test.

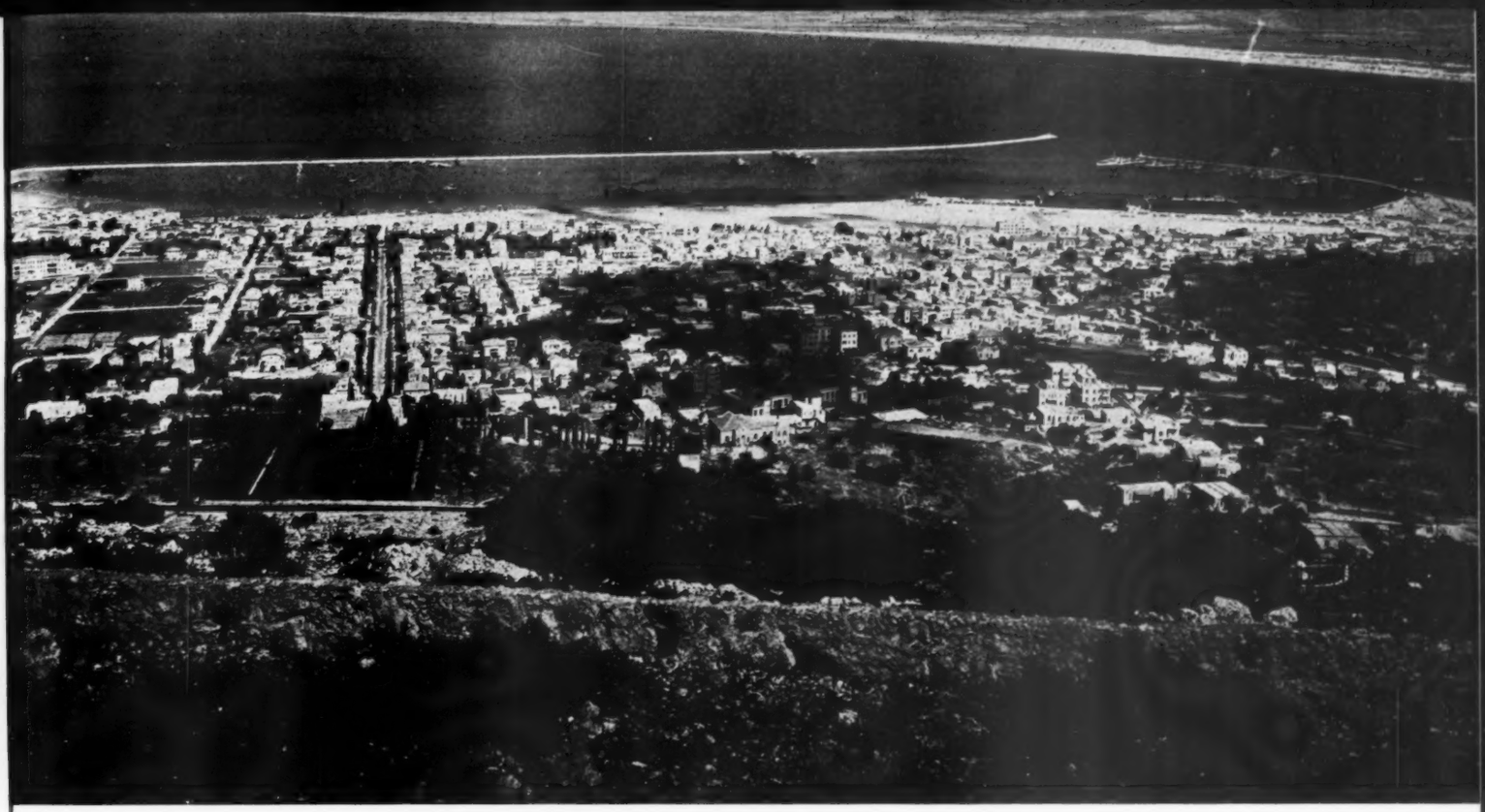
It might be added, by way of apology, that there was no trouble in making the hole, and even below 11,000 ft. good time was made in coring, a large percentage of cores actually yielding 100 percent recovery. There were only two things that hampered progress: first, the constant disintegration of the shale above and below the Temblor sand zone. This caused cavings which could be easily handled with the pump while drilling, but which occasioned much difficulty when drill pipe became stuck or parted. In such cases the pipe was soon held fast and, due to the large cavities, it was rarely possible to locate, even by use of knuckle joint with hook taking in a wide circular sweep. Thus, a lost article in the hole generally meant a sidetracking job. This, in itself, is not difficult. It has become common practice to side track an obstruction and, by directional drilling, take off in any desired direction or any angle of deviation from the vertical.

The second difficulty was the loss of water from the drilling mud into the low pressure sands, leaving a mud cake on the wall which prevented the bit from being pulled out. The latter sometimes had to be rotated out and the hole reamed to get back to bottom. Much valuable information was gained on the action of circulating fluids by having a skilled and competent physicist constantly on the job conducting field tests and laboratory experiments. The data collected will help greatly in future drilling of this nature.

Two long strings of casing were landed and cemented without difficulty—8⅝ inch casing was set as a protecting string at 9,081 ft., cemented with 600 sacks; and 6⅝ inch water shut-off string was set at 10,813 ft. and cemented with 300 sacks. From 10,813 to 11,147 ft. hole was made with 2⅞ inch external upset drill pipe without incident. Hole was cored continuously and, drilling being good at bottom, was only stopped at intervals to test oil showing, from behind 6⅝ inch casing that was logged in drilling.

Chart No. 1





Haifa Harbor, terminal of one branch of Iraq Petroleum Company's great pipeline.

Near East Becomes Strategic Oil Centre

New Alignment Emerges as Result of Long Competition of Strong Interests — Location Between Europe and Far East Gives Position of Special Importance.

AT DIFFERENT times different countries have been the centre of attention in the international oil industry. Fifteen years ago Mexico held the limelight with a succession of huge gushers along its golden lane. At another time Russia cast its spell of fear over international traders who foresaw in its rapidly growing exports the possible loss of important markets. Again it was Venezuela that captured the oil man's fancy with a wealth of production that still has not reached its full potentialities. Today it will hardly be questioned that the Near East holds the place of strategic interest on the petroleum map of the world.

This is not because of any single great oil strike although recent developments on the western side of the Persian Gulf indicate the existence there of not one but two fields of major importance. It is not because of fear that the sudden injection of a new factor may upset world markets. It is rather because the Near East, for many years past and particularly since the world war, has been the theatre of the most intense competition for control of oil. This has been the motive force behind far reaching diplomatic moves, has inspired commercial and political alliances and has set up new kingdoms in the world. War, intrigue, statecraft and romance of a kind all have entered into the development of oil in the Near East. The struggle has involved the capitals of Europe and the United States. It has enlisted the energies of brilliant men, has led explorers, engineers and constructors over blistering deserts and has brought new triumphs in the contest of mankind against obstinate conditions of nature.

Now the division of this oil empire has been nearly completed. The alignment of contending interests has been settled and the question of the part that oil from the Near East shall play in the world picture begins to be less obscure than it has been heretofore.

There is something of compelling interest in the very thought that this, the oldest part of the world, where the foundations of western civilization were laid and where man first gained knowledge of petroleum and applied it to his own use, has come to occupy a place of first rate importance in an industrial era built upon oil. It was from the viscous skimmings of oil seepages that the navigator Noah, according to Biblical account, waterproofed the Ark with which he saved mankind, just as the Tigris boatmen do today. It was the same material that the builders of ancient Mesopotamian cities used in constructing water drains and for a variety of purposes revealed by modern archaeological exploration. It was here that the first crude refinery was built. After centuries

© Underwood & Underwood

One of the seven gates of Tehran (Iran). This one is called Kazvin.

© Underwood & Underwood

Personalities in the Near Eastern oil situation: (Top) His Imperial Majesty, Mirza Riza Pahlevi, Shah of Iran; (Below) Sir John Cadman.

of desolation, during which it was given over to roving tribesmen and well-nigh forgotten by the rest of the world, this same area has now returned to occupy a rôle of industrial consequence in modern life.

One reason for the special importance attached to Near East oil is its location. It lies midway between the two smoldering volcanoes of the present day world—Europe and the Far East. Oil is essential to the conduct of modern industry but it is the very lifeblood of modern warfare. In the event of trouble east or west of Suez oil from the Near East might very well play an almost vital part.

To trace the long record of the struggle for Near Eastern oil would require too much space and involve too many essential incidents for inclusion here. A separate but important chapter is that relating to the D'Arcy concession out of which grew the Anglo-Iranian Oil Company and the great oil industry of Iran which last year produced nearly 7,500,000 tons of oil. From the beginning of its development the Anglo-Iranian has been a British enterprise and the British government recognized its national importance by buying a half interest in the company. While the history of the Anglo-Iranian has been a brilliant one and while the company remains the greatest single factor in Near East production the Iran fields were preëmpted at an early date and have remained outside the sphere of competition which has involved other portions of the Near East.

Part of the German Kaiser's vision of imperial power in Western Asia, which expressed itself in efforts at commercial penetration early in the century, was a vision of oil. The British, having no desire to see a wedge of German influence driven between Europe and India, opposed these attempts. British and Germans became rival claimants for an oil concession in Mesopotamia at the hands of the Turkish Sultan whose political lordship over this area, though somewhat tenuous in application, was still recognized by other nations. Each applicant was strong enough to block his rival's claim but was not able to grasp the prize for himself. The stalemate that resulted continued for several years until Sir Ernest Cassel proposed a compromise by which German and British interests should share equally in a company to be set up to operate the proposed concession. Followed the organization of the Turkish Petroleum Company, originally called African and Eastern Concessions, Ltd., in which the Deutsche Bank, the Royal Dutch Shell group and the National Bank of Turkey were jointly interested. Subsequently, under pressure from the British government, the shares previously intended for the National Bank of Turkey were transferred to the Anglo-Iranian. To the company as thus reconstituted the Sultan granted a concession which was signed by the Grand Vizier in June 1914. By that time the war cloud over Europe was ready to burst into a world conflagration and commercial skirmishing gave way to more deadly struggles.

During the war the petroleum possibilities of Mesopotamia were not forgotten and the British campaign for control of the area between the Mediterranean and the Persian Gulf undoubtedly was influenced in part by the desirability of possessing its potential oil resources. With

the end of the war a new claimant to participation in the affairs of the Near East appeared. The French, who had not participated actively in this theatre of war but who had had impressed upon them the critical importance of petroleum in military operations, demanded a share, not only in the administration of Near East territories but also in any oil discoveries that might take place. To this the British agreed in the celebrated compact of San Remo signed in April 1920.

The shares in the Turkish Petroleum Company held by the Deutsche Bank had been segregated during the war and these were now turned over to the French. In the post-war adjustment a separate Kingdom of Iraq had been set up with a ruler, Feisal, who had been selected during the war by Lawrence of Arabia as a proper leader for the Arab tribes and whose choice for the kingship of Iraq later was ratified by vote of the people. For the first time in history a nation was created because of the reputed existence of oil within the boundaries selected for it.

At this time everything was set for the exploitation of Mesopotamian oil by joint British and French action when a new complication arose. The government of the United States, which had long supported the policy of the open door in the Far East, now proceeded to apply that same policy in the Near East. It protested against the program adopted by France and England by which all others would be excluded from the proposed development in mandated territory and insisted that American interests should be given an opportunity to participate. After much discussion a new plan of organization was set up. Under this arrangement American oil companies were admitted to a 23¾ percent interest in the enterprise and five companies joined in underwriting the investment, operating under the name of the Near East Development Co. Shares equal to those of the American interests were allotted to the Anglo-Saxon Petroleum Co. of the Royal Dutch Shell group, the Anglo-Iranian Oil Company and the Compagnie Francaise des Petroles, in which the French government is interested, together with a group of French petroleum companies. The remaining five percent, as in the original company, went to C. S. Gulbenkian in recognition of his interest in the original holding of the National Bank of Turkey.

With this final rearrangement a new agreement was made in 1925 with the Kingdom of Iraq which recognized the original Turkish Petroleum Company concession. The Iraq Petroleum Company came into existence under joint control of interests representing seven oil companies and three different nations; the Kirkuk oil field was developed and a 1200-mile pipeline was laid across the desert to Haifa and Tripoli on the eastern shores of the Mediterranean.

Thus a second step in the development

Personalities in the Near Eastern oil situation: (Top) Sir John Cargill; (Below) James A. Moffett.

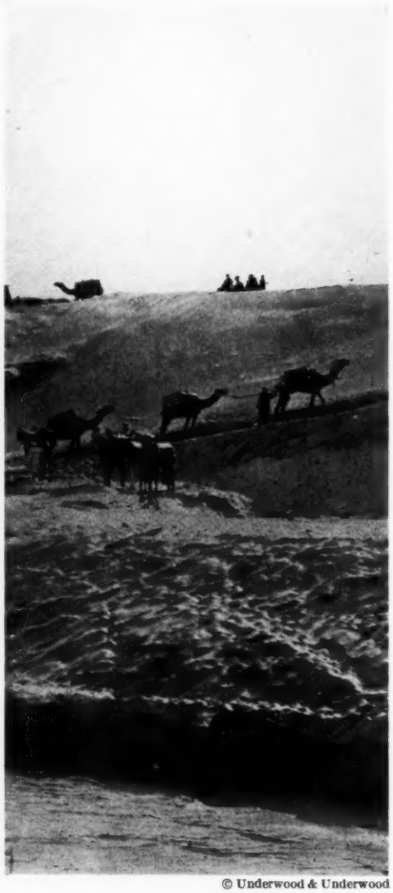
© Harris & Ewing

Modernization of Turkey—motor buses that run between Tabriz and Tehran (Iran).

©Underwood & Underwood

of Near East oil was taken and has added to the world's annual supply some 4,000,000 tons of crude yearly. Through the existence of the pipeline this oil in effect is produced on the shore of the Mediterranean, 4,000 miles nearer to European markets than it would be if it had to make the long voyage via Aden and the Suez Canal. It is divided pro rata among the proprietary groups but as a matter of convenience the greater part of it is conveyed to France for refining as each of the four groups owns refining facilities there. In this market Iraq oil has displaced in large part the crude formerly imported from the United States and South America. Ownership of the American interest in Iraq oil originally was divided between Atlantic Refining Company, Gulf Oil Corporation, Pan American Petroleum and Transport, Standard Oil Co. (New Jersey), and Socony-Vacuum Oil Company. The two latter, by purchase of the interests held by the others, are now sole owners of the American share in the company.

Under the terms of its first agreement with the Iraq government the Iraq Petroleum Company was required to select by 1927 the plots on which it elected to drill but this was changed in a revision of the contract completed in 1931 and the company received instead the exclusive right to exploit the oil resources of the vilayets of Baghdad and Mosul, east of the River Tigris. As soon as this was announced another company, the British Oil Development Co., Ltd., closed an agreement covering the territory lying westward of the river, covering about 40,000 square miles. It was already known that oil existed in this area for the first well drilled by the Germans in what is now Iraq had been located at Quiyareh near Mosul, within the borders of the concession. The Iraq Petroleum Company had had the opportunity of exploring this area but had decided that it was less promising than the eastern field. The British Oil Development Co., however, was not daunted by these considerations. Like the Iraq Company it was of British registration, but in addition to the original group of British investors large blocks of shares were held by various continental interests. The man most active in the organization and early management of the company was Francis W. Rickett who has had a finger in oil deals in various parts of the world and who figured subsequently in the somewhat sensational Ethiopian concession granted to an American company at the beginning of the Italo-Ethiopian war. The fact that financial groups in Italy, Germany, France and Switzerland, as well as England, participated in the early ownership of the



© Underwood & Underwood

Inland from the Persian Gulf in Saudi Arabia.

company is testimony to Mr. Rickett's ability as a salesman promoter.

The Italian share in the British Oil Development Company, Ltd., and in Mosul Oilfields, Ltd., which subsequently was formed as the operating company of the group, was held by the Azienda Generale Italiana Petroli (AGIP) controlled by the Italian government. In the course of further financing required by the company's payments to the Iraq government and by its development work, the Italian holdings were largely increased and according to a report filed last year they exceeded those of any other group. At that time it was denied, however, that the Italians controlled the company. The exact situation was somewhat obscured by the existence of an option held by the Egyptian government on 600,000 shares while a restraining suit brought by Ferrostaal, a Dutch organization, was based on its claim to hold a similar option. The Egyptian option was allowed to lapse at its expiration on May 31 of this year and recent developments tend to support the belief that AGIP, perhaps in conjunction with German shareholders, are actually the dominating factor.

From its inception the Mosul company has been something of a mystery. Tests have been made extending over a wide area. Some thirty wells have been drilled to date and several of those that have been completed are said to be large producers but exact information as to their output has not been divulged. Under the terms of its contract the company is required to build a pipeline or a railway to transport an output of 1,000,000 tons yearly. Plans for a pipeline to extend from Mosul to Alexandretta on the Mediterranean were drawn some years ago but more recently reports have been in circulation that the oil found in the Mosul field was so heavy that its conveyance by pipeline presented some difficulty and that railway transport would be utilized to move it to the coast.

To provide a direct railway line covering this route it would be necessary only to fill in the gap in the existing system between Mosul and Nissibin and to build a short extension from some point near Aleppo to Alexandretta. Earlier in the year it was announced that this construction was soon to be undertaken which possibly gave rise to the story that the pipeline was not to be built.

A statement made to the writer, which has every evidence of being authoritative, is that the exploratory drilling done in Mosul has demonstrated the existence of a very extensive oil pool, that the oil is of good quality and can be passed through a pipeline without the slightest difficulty in any temperature, that a pipeline probably will be built with construction starting possibly within the year, and that the railway may also be utilized as a supplementary means of transport.

While Mosul remains an undefined factor in the Near East situation it seems probable, therefore, that such uncertainty as now surrounds it will soon be cleared away. Likewise it seems probable that when Mosul oil does begin to move westward the Italians will have much to say about its disposal. Like other nations Italy has been reaching out for supplies of crude which will not be subject to interruption in the event of war and the eastern shore of the Mediterranean seems a strategically advantageous point for this purpose.

Under the agreement between the companies participating in the Iraq Petroleum Company none of them was to undertake oil development on its own account within an area indicated on the company maps by a red line. Inside that red line lay the Bahrein islands on the western side of the

Persian Gulf. The Gulf Oil Corporation, then one of the American group which collectively owned a quarter interest in the Iraq enterprise, held a concession to explore for oil in Bahrein. This concession had been obtained from the Sheik of Bahrein by a private syndicate and transferred by these holders to the American company. The latter, being now under obligation not to develop this holding independently, sought a purchaser for it.

There had been some discussion about this time between Gulf and Standard of California officials of a coalition of interests. Although it led to no actual union it was natural enough that the Bahrein concession should have been offered to the Pacific Coast company which was familiar with the situation and where it was felt that oil if discovered would be in friendly hands. Certain members of the Iraq petroleum group believed that their company should take over the Bahrein property but that proposal evidently did not find favor with the majority and the concession was transferred to the California company. The consideration involved was not made public but it was stated at the time that Gulf sought merely to be reimbursed for its investment.

Up to that time Standard of California had not developed production in the eastern hemisphere but it sold crude oil and products to the Orient and was not averse to obtaining a certain amount of production in that part of the world. The general opinion among oil men conversant with conditions in the Near East seemed to be that whatever production might be developed in Bahrein would be inconsiderable. The principal island contains only 230 square miles.

The Bahrein Petroleum Co., Ltd., which was the name of the subsidiary organized by Standard of California to carry on its operations in this field started its drilling program in 1930. Its first wells proved to be substantial producers and later drillings to somewhat greater depths have shown still better results. To date 31 wells have been drilled of which 26 are active producers. Well No. 31, brought in during May, 1936, recorded a flow of 26,880 bbl. from 2,273 ft. With production mounting toward 3,000,000 tons annually and each new well adding to the total, it became evident that Bahrein was likely to outrank Kirkuk itself as a producing field.

The problem of finding outlets for this mounting flow of oil assumed serious proportions. Standard of California had no marketing organization on the eastern side of the world. To create such an organization and to win a share of European and Far Eastern markets was a costly undertaking and one sure to be fought by the interests already established in these fields. When only a few cargoes a month were being produced it was possible to place them in different markets from Japan on the east to France and Germany in the west without much disturbance, but this could not be done with a larger output. In 1935 Bahrein Petroleum Co. took the logical step of starting construction of a refinery which is now approaching completion.

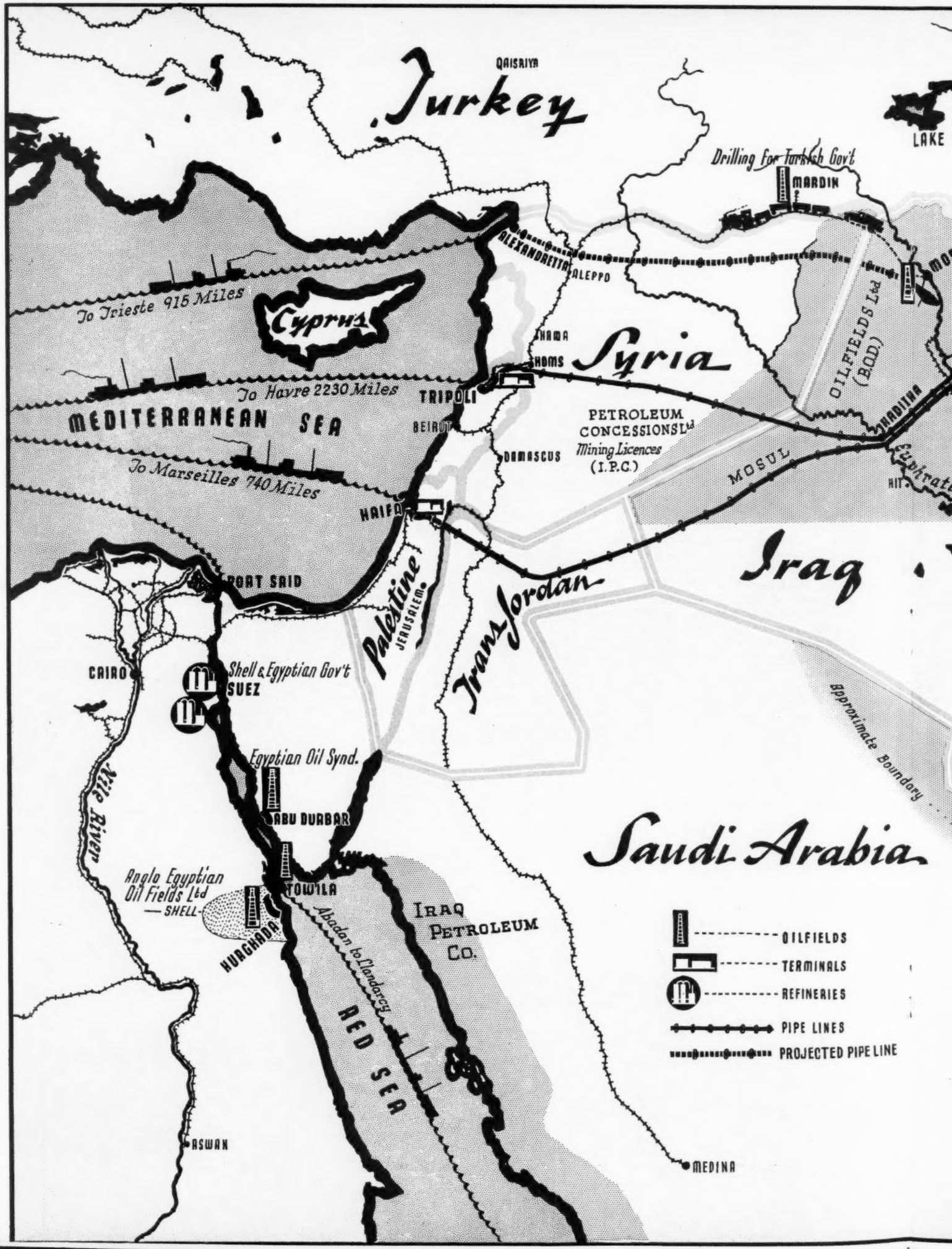
California Arabian Standard Oil's discovery well in Eastern Saudi Arabia, Dammam No. 1, brought in Sept. 4, 1935.

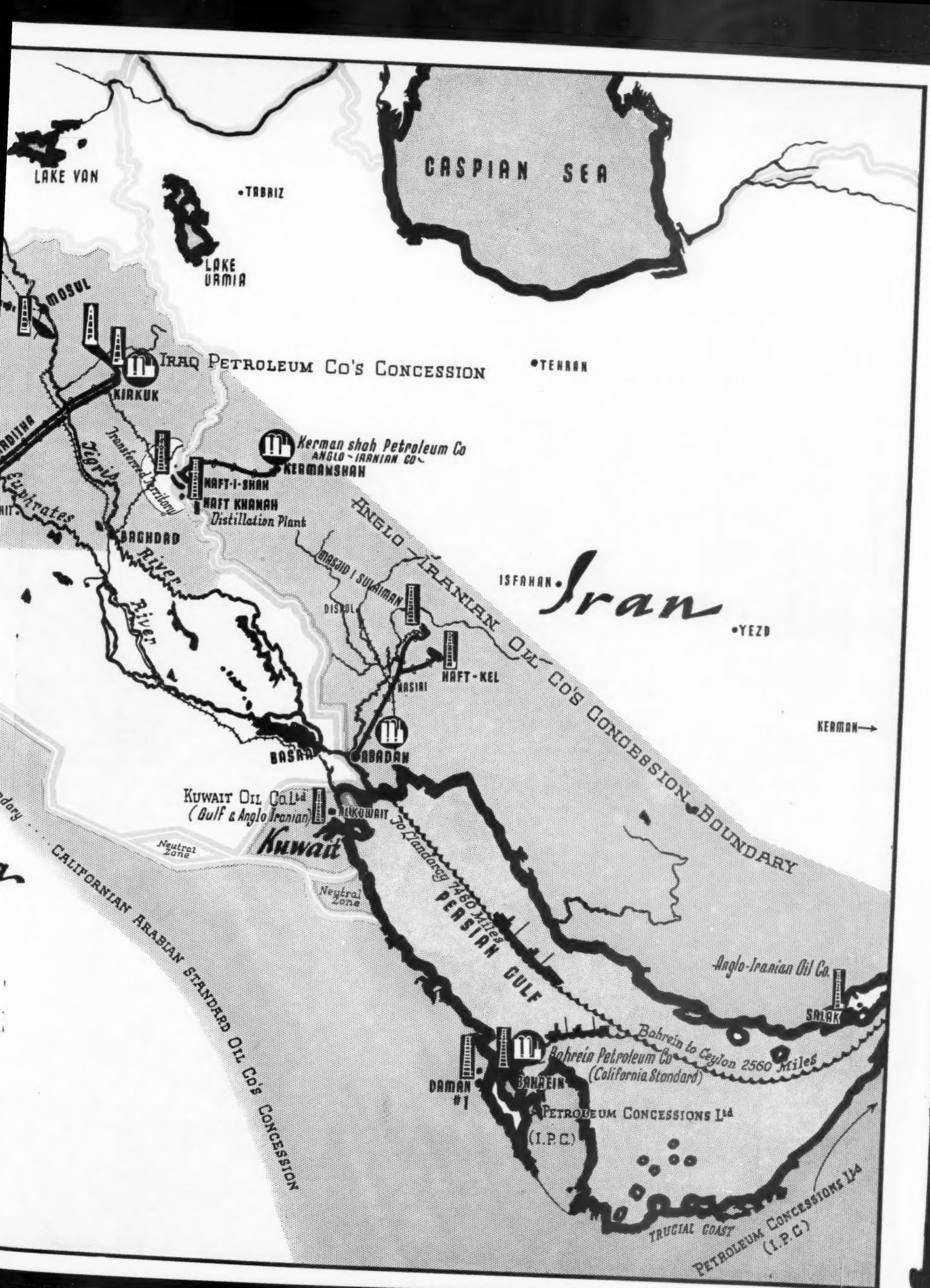
Meanwhile the companies that have most at stake in maintaining the stability of international markets—the Royal Dutch Shell group, Anglo-Iranian with the allied Burmah Oil Company and the two American companies, Standard of New Jersey and Socony-Vacuum, whose Far Eastern interests are joined in Standard-Vacuum, viewed with some uneasiness the progress of events in Bahrein. With a view to some arrangement for the joint handling of the Bahrein product a series of conferences between representatives of these companies and officials of Standard Oil Company of California took place in New York in the latter part of 1935.

The situation was one that called for realistic treatment. Oil once produced is bound to find a market. Oil produced under the economical conditions that exist in Bahrein has little to fear from competition. The problem of disposing of it without undue market disturbance becomes one for its competitors rather than for the producer himself.

That at least was the position taken by Standard of California. It was willing to enter into an agreement with the big international companies by which the latter would sell its products, or to become a partner with them in a new marketing organization, or to dispose of its interests entirely—at a price. The difficulty was that the interests of the other negotiators were not identical. Some of them were interested less than others in the markets to which Bahrein oil naturally would flow. Others felt that they already had made their full share of concessions in the cause of international market stability. Outright control of Bahrein involved a greater expenditure than they cared to undertake, greater too than they believed justified by the showing thus far made in the matter of production. For these various reasons the negotiations came to nothing. Shortly after their termination two other large producing wells were brought in and the value placed upon the property by its owners correspondingly increased.

Back of Bahrein, however, loomed another development of unknown possibilities. Having embarked on the task of seeking oil in the Near East, Standard of California had reached out and obtained a concession for exploration and development in Saudi Arabia, that great desert region occupying the larger part of the peninsula south of Iraq. It is not to be assumed that this was obtained simply for the asking or that it was handed to Standard of California with the blessing of the other international companies as was the case with Bahrein. Saudi Arabia's potentialities were unknown but some geological work had been done there and it was recognized that the existence of a prolific field along the eastern side of the peninsula was not beyond reasonable expectation. The British government felt that in view of its extensive interests in southwestern Asia it would be entirely appropriate to have the development of further oil resources in British hands. Other oil companies were eager contenders for the possible prize. Diplomatic


Turkey
QAISRIYA
LAKE
Drilling for Turkish Gov't
MARDIN
ALEXANDRETTA
ALEPPO
To Trieste 915 Miles
Cyprus
HAMA
HOMS
Syria
OILFIELDS Ltd (B.O.D.)
To Havre 2230 Miles
TRIPOLI
MEDITERRANEAN SEA
BEIRUT
PETROLEUM CONCESSIONS Ltd
Mining Licences
(I.P.C.)
DAMASCUS
MOSUL
To Marseilles 740 Miles
HAIFA
PORT SAID
Palestine
JERUSALEM
Trans-Jordan
Iraq
CAIRO
Shell & Egyptian Gov't
SUEZ
Egyptian Oil Synd.
ABU DURBAR
Nile River
Approximate Boundary
Saudi Arabia
Anglo Egyptian Oil Fields Ltd
— SHELL —
TOWILA
HURGHADA
Abadan to Haifa
IRAQ PETROLEUM CO.
RED SEA
ASWAN
MEDINA
OILFIELDS
TERMINALS
REFINERIES
PIPE LINES
PROJECTED PIPE LINE


CASPIAN SEA
LAKE VAN
TABRIZ
LAKE URMIA
MOSUL
IRAQ PETROLEUM CO'S CONCESSION
TEHRAN
KIRKUK
Kermanshah Petroleum Co
ANGLO-IRANIAN CO.
KERMANSHAH
KAFT-I-SHAH
KAFT KHANAH
Distillation Plant
Transferred Territory
Tigris
Euphrates
BAGHDAD
River
River
MASJID I SULAIMAN
ANGLO-IRANIAN OIL CO'S CONCESSION BOUNDARY
ISFAHAN
Iran
YEZD
KASIRI
HAFT-KEL
KERMAN
BASRA
ABADAN
KUWAIT OIL CO. Ltd
(Gulf & Anglo Iranian)
KUWAIT
Kuwait
Neutral Zone
Neutral Zone
To Landorey 7480 Miles
PERSIAN GULF
CALIFORNIAN ARABIAN STANDARD OIL CO'S CONCESSION
Anglo-Iranian Oil Co.
SALAK
Bahrein to Ceylon 2560 Miles
Bahrein Petroleum Co
(California Standard)
DAMAN #1
BAHREIN
PETROLEUM CONCESSIONS Ltd
(I.P.C.)
TRUCIAL COAST
PETROLEUM CONCESSIONS Ltd
(I.P.C.)

powers were called into play but in the end the wise and wary Ibn Saud, ruler of Arabia, awarded the concession to the California Arabian Oil Co., which was another subsidiary of Standard of California organized to operate in this arena.

The negotiations leading up to this concession were conducted for the California company by Lloyd N. Hamilton and Francis E. Loomis, veteran diplomat and former Assistant Secretary of State of the United States, but for an understanding of the factors contributing to the result it is necessary to go back once more to the World War and to events immediately succeeding it.

During the course of that conflict Abdul Aziz ibn Sa'ud, chief of the Wahabis, who are regarded as the most strict and puritanical of Arab tribes, had been consistently friendly to the allied cause, personified in that part of the world by Great Britain. British officials in the Near East, however, at least those who had most influence in Whitehall, looked with scant favor upon Ibn Saud and advocated the maintenance of a balance of power in Arabia that would prevent any single leader from becoming too troublesome. In the apportionment of Near Eastern territory following the war, Ibn Saud's rival, Hussain ibn Ali, father of King Faisal of Iraq, was provided with a throne in the Hedjaz and a more hated rival, Ibn Rashid, was left in control of Hail, while the Imam of Yamen, who had continued faithful to Turkey during the war, remained undisturbed in his principality in the west.

In the decade following, however, Ibn Saud revised these arrangements by force of arms. In 1921 he captured Hail and made it part of his territory and in 1926 Hussain was forced to abdicate and the Hedjaz was absorbed in the Wahabi domain. With that achievement Ibn Saud became master of all Central Arabia, his authority extending from the Persian Gulf to the Red Sea and including the greater part of the peninsula south of Iraq and Kuwait. Although it has no direct bearing upon the oil situation it may be mentioned that only last year the forces of Ibn Saud administered a severe drubbing to the Imam of Yamen, though not carrying it to the extent of deposing the ruler.

It may be, therefore, that the arguments of the American oil representatives appealed more strongly to Ibn Saud because he felt that he had small reason to be grateful to the British, or considered that it was the part of safety to have the concession in the hands of those who would have no ambitions for territorial expansion but would confine their activities to purely commercial exploitation.

Whatever the underlying reasons for preferring the offer of Standard of California, that company holds the right for sixty years "to explore and search for and drill and extract and treat and manufacture and transport and export" all manner of petroleum, asphalt, oil and carbonaceous matter in the eastern portion of the Kingdom of Saudi Arabia. The exact limits of the concession appear to be somewhat indefinite, as is not surprising in a land where there are no natural boundaries, but it covers the territory considered most favorable to the production of oil.

A survey of the area was begun immediately after the agreement was signed, in 1933, and drilling commenced in 1935, the first well, Dammam No. 1, being put down at a point about 45 miles northwest of Bahrein. This first well drilled into a heavy gas cap and a second site was selected a short distance further north. Dammam No. 2 was brought in in May, 1936, with a reported flow of 3,800 bbl. but this was before the well had mudded off and subsequent acid treatment is understood to have resulted in much greater flow. From preliminary indications Saudi Arabia promises to become a field equal to Bahrein and possibly surpassing it both in output and in the grade of oil produced.

With these two developments Standard of California found itself engaged in production far from its home base and on a scale much larger than had been anticipated. At this juncture its representatives approached The Texas Corporation which had no production of its own in the eastern hemisphere but was engaged in the sale of petroleum products in practically every market in that part of the world. The needs and facilities of the two companies matched perfectly and the result of the negotiations was the organization of The California Texas Oil Co., Ltd., jointly owned by Standard of California and The Texas Corporation, to control the production of the former and the marketing facilities and equipment of the latter in all the vast area east of Suez and west of the Americas.

Thus an entirely new factor has been introduced into the Near East in the form of this independent American group which is plainly equipped and destined to play a highly important part in future operations within this area. It is not impossible that later developments may put it in possession of producing fields nearer to the Mediterranean than either the oil of Kirkuk or Mosul and that it ultimately may look westward as well as eastward for its markets. But that is a matter for the future.

While the companies whose position has been outlined above are the principal factors in Near Eastern production there are others that may attain a position of importance. Kuwait Oil Co. Ltd., jointly owned by Anglo-Iranian and Gulf Oil Corporation, holds a concession in the principality of Kuwait where one well has been drilled and two others are now being started. In Syria, Petroleum Concessions (Syria) Ltd., an offshoot of Petroleum Concessions Ltd., which is controlled by the Iraq Petroleum Co., holds mining licenses covering large areas but these have not been developed as yet. Petroleum Concessions Ltd. also claims petroleum rights in the Quatar peninsula and along the Trucial Coast. On the shores of the Red Sea and the island of Towila are concessions of minor extent owned respectively by the Egyptian Oil Syndicate and Affiliated Oilfields Ltd. On the western side of the Red Sea are the producing fields of Anglo-Egyptian Oilfields Ltd., affiliated with Shell. North of Syria the Turkish government is conducting drilling operations which so far have resulted only in bringing in a gas well at Mardin. Further drilling is to be done.

At the time when the Iraq pipe line was building there was much apprehension among the officials of international oil companies as to the effect of throwing this additional supply upon markets in which competition from many quarters had re-

Today, as centuries ago, oxen turn waterwheels in Iran.

© Underwood & Underwood

duced prices to unprofitable levels. In reality the advent of Iraq oil created no serious market disturbance. It has displaced a certain amount of oil from North and South America, in France particularly, but without imposing any particular hardship on western producers because it came along at a time when the world was recovering from a serious industrial depression and when consequently the demand for petroleum products was increasing.

Somewhat the same feeling exists today regarding oil from Bahrein and Saudi Arabia. If this oil is to be marketed in the East it will first of all displace a certain amount which heretofore has moved to that area from the United States. This, however, will not provide room for the entire output from the California Texas holdings in the Near East, augmented, as they are likely to be, by additional production from recently acquired concessions in Sumatra and other points in the Far East.

To utilize its present actual production the company is moving at once to establish fuel oil stations from Suez east to China and the Philippines and is preparing to extend its facilities for handling lighter products throughout its marketing area. Although the Bahrein refinery is not yet completed plans are under way for doubling its capacity with the possibility of additional refinery construction to follow. Unless the growth of demand in the East is rapid enough to absorb this additional supply some of the competing marketers must either give ground or wage battle.

The test may come first in India. Production in India is insufficient to supply the requirements of that market and some 800,000 tons of petroleum products, chiefly fuel oil and kerosene, are imported annually. The Burmah Oil Co. Ltd. which is the chief producer in India has long asserted its claim to first lien on the Indian market. Sir John Cargill, chairman of the company, and Robert Watson, his chief associate, never have ceased to assert the superior rights of indigenous production or to use vigorous measures against invaders of their territory. In his address to shareholders a few weeks ago Sir John Cargill made pointed reference to a new source of production "in our part of the world" which might not fit into the existing scheme of things. His remarks may have been due to his knowledge that this new interest, through a recently organized subsidiary, was planning to establish fuel oil stations in various parts of India and to develop an extensive business in this field.

While it is not to be assumed that the directors of the California Texas Company are looking for trouble with any company established in eastern markets they are not likely to quail before veiled threats or open challenge. The company's position is a strong one, with cheap production and with ocean transport facilities at the very doors of its refinery. In any struggle for place in eastern markets it would be able to give a good account of itself—which perhaps is a good reason why anything in the nature of intercompany conflict may be avoided.

Baba Gurgur, discovery well of the Kirkuk field.

Meanwhile the other interests concerned in Near East production have not been idle and at the very end of July it was announced that the Iraq Petroleum Company, through S. H. Longrigg, chief of its lands department, had obtained from Ibn Saud a concession covering the entire Red Sea coastline of Saudi Arabia and extending inland for a distance of sixty-two miles. It was reported that Italy also had been angling for this concession, a logical step in view of Italy's expanding interests in northeastern Africa.

In the Near East as nowhere else the great oil powers of the world stand face to face while no less than four important nations—Great Britain, France, the United States and Italy—have acquired important stakes in its petroleum resources. In the case of all except the United States the governments of these nations are directly interested in the ownership of companies concerned in Near East exploitation. It is needless to stress the possibilities in such a situation.

Not only because it is to a greater extent than any other area an international meeting ground of petroleum interests does the Near East assume a position of vast importance but also because it is a strategic centre with relation to four-fifths of the world's population. From its pipe line ports in the eastern Mediterranean the shipping distances to the chief European markets are no more than half as great as from North or South America. From the refineries built or building along the Persian Gulf it is but a step to western India as nautical distances go and even Japan and Australia are within convenient reach. The balance of power that has been set up is such that an agreement for the free movement of Near Eastern oil in peace or war may be looked upon as a logical possibility. Whatever else may happen oil from the Near East will change the direction followed by the international flow of petroleum in both the East and the West and it is practically certain to displace oil from the Americas in some important markets.

World Petroleum Abstracts

Summaries of the Most Important Articles as Published in the Oil Press of the World Dealing With Technical and Economic Aspects of the Industry. *Edited by Dr. O. W. Willcox*

Petroleum Geology

THE ORANGE (TEXAS) OIL FIELD.—Alexander Deussen and E. W. K. Andrau, in BULL. AM. ASSOC. PETROLEUM GEOLOGISTS, vol. 20 (1936), No. 5, pp. 531–559; 9 figs.

The Orange, Texas, oil field was discovered in 1913. It is a deep dome, in which salt has never been encountered in drilling. The peak of development and production was reached in 1922. Four hundred twenty-four locations have been drilled, of which 318 wells produced oil and 106 wells were dry. The greater portion of the oil is produced from Pliocene-Miocene sands. Oligocene oil is found southeast of the Miocene oil-producing area. This is due to a faulted condition of the dome. The average depth of the wells is 4,000 ft. The average total production is 79,000 bbl. per well drilled.

GEOLOGY AND GEOPHYSICS OF HIGH ISLAND DOME (GALVESTON COUNTY, TEX.).—Michel T. Halbouty, in BULL. AM. ASSOC. PETROLEUM GEOLOGISTS, vol. 20 (1936), No. 5, pp. 560–611; 27 figs.

The High Island dome was first drilled for oil in 1901; however, the first production was obtained from the porous cap rock in 1922, on the super-dome structure. The Yount-Lee Oil Company in 1931 proved the existence of an overhang at High Island and has since developed the field from the northwest flank to the southeast flank. The development at present is toward the east flank.

The cap rock at High Island is divided into a false cap rock and a true cap rock. The false cap rock is a hard sand and lime rock ranging in thickness from 200 to 1,300 ft. The true cap rock lies underneath the false cap rock and consists of a series of caps. At the base of the series is anhydrite which grades upward into gypsum and a calcite cap above the gypsum.

The overhang has so far been proved to exist on all flanks that have been drilled. There is a cap-rock overhang as well as a salt overhang; the cap-rock overhang extends outward and away from the salt. Production is just as prolific under the cap-rock overhang as under the salt overhang. The dome is somewhat lopsided in that the southeast flank is approximately 1,500 ft. higher than the northwest flank. Faulting has been detected on the south and southeast flanks. A theoretical peripheral fault is mapped from the northwest to the southwest flank. Oil has been produced in commercial quantities from the cap rock, Pliocene formation, Miocene formation, *MDv* zone, *Discorbis* zone, and *Marginulina* zone. The *Heterostegina* zone at High Island has not yet been penetrated or encountered. The Pliocene and Miocene production is very small and practically all of the sands in these two formations contain water.

The *MDv* zone is a new paleontological zone mapped by the writer as lying immediately above the true *Discorbis* zone of the Middle Oligocene, and equivalent to Lower Miocene in age. This new zone is characterized by both Lower Miocene and true *Discorbis* fauna. Therefore, the name *MDv* has been chosen to represent the zone because of the occurrence of Miocene fauna associated with *Discorbis* cf. *D. vilardeboana* and its fauna; thus, the name: *MDv*.

The *MDv* zone has so far been proved to be the most prolific of any productive zone. Six different sand horizons have been found in this zone. The *Discorbis* zone production has been limited; however, some of the company's latest and best wells are producing from this zone. Only one sand has been found in the *Marginulina* formation. The oil at High Island is divided into three types, ranging from 24 to 44 deg. A.P.I. gravity.

OIL POOL OF OPEN RESERVOIR TYPE.—John Emery Adams, in BULL. AM. ASSOC. PETROLEUM GEOLOGISTS, vol. 20 (1936), No. 6, pp. 780–796.

It has been stated that no commercial accumulations of petroleum have been found in areas where the controlling structure is a simple terrace in the reservoir sand. That is, in all pools located on apparent terraces, trapping is caused by buried closure or by variations in the porosity of the reservoir rock. In most instances, this is undoubtedly true. However, pools are known in which open terraces are the only causative structures for retaining the oil in place. The Wheat pool is believed to be an example of this type. A description of the geology is followed by suggestions as to the possible origin and maintenance of such an accumulation.

THE CONROE OIL FIELD (MONTGOMERY CO., TEX.).—Frank W. Michaux, Jr. and E. O. Buck, in BULL. AM. ASSOC. PETROLEUM GEOLOGISTS, vol. 20 (1936), No. 6, pp. 736–779.

The Conroe oil field, located in Montgomery County, Texas, was discovered in 1931. It is a broad ovate structure crossed by several normal faults which form a central graben area. The maximum vertical displacements of these faults range from 130 to 165 ft. Production is obtained at an average depth of 5,050 ft. from the Cockfield formation of Upper Claiborne (Eocene) age, which has been uplifted more than 800 ft. above its normal position. The average thickness of the Conroe producing sand throughout the field is 60 ft. The recoverable reserves have been estimated to be about 600,000,000 bbl. Currently the field is producing daily 47,700 bbl. of oil from 829 wells, of which 53 wells are producing salt water in varying amounts.

There is free communication and equalization of fluid across the fault planes so that there exists a unit reservoir wherein the fluids segregate themselves at uniform levels throughout the field. The interval within which sand may contain oil is 130 ft., or between the −4,860-ft. and −4,990-ft. datum planes. A large gas cap overlies the oil and occupies an interval of 170 ft., or between the datum planes of −4,690 and −4,860 ft. Conroe has a proved area of 17,200 acres and has produced a little more than 40,000,000 bbl. of oil up to January 1, 1935. Reservoir pressures became stabilized after the field had produced about 29,000,000 bbl. of oil and the pressure decline since then has been less than one pound per 1,000,000 bbl. of oil produced.

Geophysics

EXPLORATION ON THE GULF COAST TO 1936.—E. E. Rosaire and M. E. Stiles, in GEOPHYSICS, vol. 1 (1936), No. 1, pp. 141–148.

In the early days of oil history of the Gulf Coast, oil-bearing salt domes were discovered by non-geophysical methods, and the forecast was made that the geophysically discovered salt domes would be less productive than the non-geophysically discovered domes. The authors examine this hypothesis on the basis of the records of the fields discovered in these two contrasting manners, taking into consideration (1) rate of discovery, (2) relative difficulty of establishing production, (3) comparison as to the rate of producing oil to date, and (4) the question of reserves. As regards rate of discovery it is shown that it required 35 years of exploration by non-geophysical methods to discover 43 domes, or 1.2 domes per year, whereas 68 domes were discovered in 10 years by geophysical methods, or 6.8 domes per year. The oil fields discovered geophysically were proved with a marked decrease in the time of development and with materially fewer exploratory wells; the accuracy of prediction materially helped unit ownership and reduced competitive drilling. The combination of these factors has resulted in a steady increase in the amount of oil produced from geophysically-predicted structures. The production of fields yet to be confirmed by the drill is expected to amount to nearly 15,000,000 bbl. per year for the next three to five years, and these fields are expected to show a much smaller rate of decline than was characteristic of non-geophysically predicted fields.

USES OF THE SEISMIC METHOD IN COAL SURVEYS.—Fr. Trappe, in OEL UND KOHLE, vol. 12 (1936), No. 18, pp. 384–387.

Seismic reflection surveys are now extensively used to determine the depth to the carbon surface in German coal districts. Post-carbonic faults are traced and horsts are outlined in detail.

Flank investigations on salt domes of the mushroom type are also carried out with re-

Partial Table of Contents

- **INTEGRATED COMPANIES**
  A complete list of all companies engaged in producing, refining and marketing. Their capital structure, dividends, subsidiaries, executives, directors and operating officials.
- **PROMINENT OIL MEN**
  The names, positions and directorships held by the leading men engaged in the petroleum industry throughout the world.
- **REFINERS**
  Location, capacity, type of plants, personnel, etc.
- **NATURAL GASOLINE COMPANIES**
  Size, type, and location of plants with complete data on personnel, etc.
- **PIPE LINE COMPANIES**
  Location, length and capacity of lines together with officers, capital structure, etc.
- **MARKETERS OF PETROLEUM PRODUCTS**
  Territory served, annual gallonage with information on tax requirements of each state.
- **BRANDS AND TRADE NAMES**
  The names and owners of all brands of gasoline and lubricating oils.
- **FUEL OIL DEALERS**
  Complete list by states.
- **OIL BROKERS**
  Complete list by states.
- **EXPORTERS OF PETROLEUM PRODUCTS**
  Complete list by states.
- **BUNKERING STATIONS OF THE WORLD**
  Showing location, operator, nationality, code address, codes used, tankage, kind of oil stocked, capacity, normal supply, berthage and depth of water, method of delivery, source of supply, loading costs, etc.
- **MARINE TRANSPORTATION COMPANIES**
  Location, and territory served.
- **REGISTER OF TANK VESSELS**
  Owners, names, type and capacity of ships.
- **DRILLING CONTRACTORS**
  A complete list of all contractors operating in the United States.
- **ROYALTY OPERATORS**
  A complete list with location of head offices.
- **OIL COMPANIES OUTSIDE THE UNITED STATES**
  A detailed list of every known company, arranged by countries. Financial set-up, subsidiaries, names of officers, etc.
- **REFINERS OUTSIDE THE UNITED STATES**
  The location, size and type of every refinery is given with the names of prominent officers.

Orders may be sent to any of the following addresses:

WORLD PETROLEUM

New York, N. Y. ..... **56 West 45th Street**
Los Angeles, Calif. ..... **Bendix Building**
San Francisco, Calif. ... **58 Sutter Street**
Houston, Texas ..... **Gulf Building**
London, England ..... **3, Savoy Place**
Victoria Embankment, W.C.2

This book will save you time and annoyance

The 1936 edition of World Petroleum Directory is the result of five years constant work by the editorial staff of World Petroleum.

Every known source of information here and abroad has been investigated. Financial and statistical reports have been examined and all data has been verified.

You will find complete data on the properties, financial structure, subsidiaries, dividend records, etc. of all the oil companies throughout the world.

The names of all officers and directors, and the location and code address of all foreign offices will be of great help in your correspondence.

The new edition is nearly double the size of the earlier issues, over 25,000 changes have been made and the many new departments added make it the largest and most complete directory of the oil industry published to date.

The coupon below will bring your copy promptly.

WORLD PETROLEUM DIRECTORY

Gentlemen:

Send us one copy of the new 1936 Directory.
or Payment will be made on delivery ☐
Enclosed are $10.00 ☐
(2 Guineas, London)

Company .....

Individual .....

Street .....

City ..... *State or Country* .....

flected waves. A profile is illustrated which was detailed with refracted and reflected seismic waves. Reflected waves penetrate to much deeper horizons than refracted waves. Emphasis is laid on the importance of seismograph records in deep bore holes in order to obtain accurate average velocities.

On April 1, 1936, the following field parties were at work in Germany: 6 seismograph parties, 1 seismic foundation soil research party, at least 12 torsion balance parties and 4 gravimeter parties.

THE DIP NEEDLE AS A MAGNETOMETER.—C. O. Swanson, in GEOPHYSICS, vol. 1 (1936), No. 1, pp. 48–96.

The dip needle in its ordinary use measures no one component of the earth's magnetic field, but reflects the combined effects of changes in both the inclination and the intensity; thus it is not a magnetometer as ordinarily used. However, by taking two sets of readings one may calculate from them the horizontal and the vertical components of the magnetic field, and the dip needle then becomes a horizontal and a vertical magnetometer. This paper is an account of investigations conducted with the object of testing the practical usefulness of the instrument along these lines, the discussion being divided into the following parts: I. Basic mechanical principles; II. Corrections to observed readings; III. Theoretical probable errors in calculated components; IV. Field data on errors in calculated components; V. Suggested field and office methods; VI. Examples of the benefits obtained.

The resulting benefits are that the usual type of interpretation is simplified, and the field of inferences from magnetic data is extended.

GEOPHYSICAL PROSPECTING UNDER WATER.—B. Mills, in OIL WEEKLY, vol. 81 (1936), No. 11, pp. 17–22.

In a discussion of pollution in the development of submerged leases along the coastal belt, the writer takes occasion to describe geophysical prospecting on leases in Galveston bay. These leases were obtained without any assurance that oil is present; this is a matter which is being investigated by a seismic survey. The equipment includes a large houseboat anchored in the bay which serves as a recording station, a barge for drilling the test holes, and subsidiary craft for the use of the testing crew. The test holes are drilled at one-mile intervals and are carried about 75 ft. to the solid clay. A rotary core drill is used and a 5-inch casing is run to the bottom of the hole; the explosive charge is ½ to 2 lbs. of dynamite. The shock from the charge is not great enough to be felt at the surface, so no marine life is destroyed. The water ranges in depth from six to nine ft. The placing of geophones and stringing wire under water involves much greater effort than similar operations on land. Two oil companies are now making surveys in this manner.

FUNDAMENTAL PHOTOGRAPHIC PROCESSING OPERATIONS INFLUENCING PRODUCTION OF SEISMOGRAPHIC RECORDS.—Frederick A. Tompkins, in GEOPHYSICS, vol. 1 (1936), No. 1, pp. 107–114.

Photographic work in connection with seismographic surveys is mostly carried out under conditions far different from those of a permanent studio, where all conveniences are at hand and temperature is controlled. In this paper an Eastman Kodak Company expert reviews the various factors involved in developing, fixing and washing of records produced by a seismographer, whose studio is a truck not too luxuriously furnished.

Drilling

HANDLING HOT MUD.—L. G. E. Bignell, in OIL AND GAS JOUR., vol. 34 (1936), No. 50, pp. 26–27.

Handling hot mud during the drilling of wells by the rotary method has become a major problem in the Rodessa (La.) field. At depths of 5,500 to 6,000 ft. the mud-laden fluid becomes heated to about 190 deg. F. One of the problems created by this circumstance is in connection with cementing jobs. In summer time it has been a common practice to use as much as 6,000 lbs. of ice for chilling the mixing water while cementing the last string of casing just above the producing formations. One contractor has found it advantageous to make a 9⅝-inch hole for 7-inch casing set at 5,800 to 6,070 ft.; by providing this extra space between the outside of the casing and the wall of the hole the pressure required to place the cement is reduced, so that the job can be finished without use of ice, and the effect of the heat on the setting of the cement is diminished by the saving of time.

One feature common to this field, but unusual elsewhere, is the change in the mud viscosity occasioned by the liberation of salt crystals when penetrating the anhydrite formation. Another unique feature is the tendency of the mud to dry out. This tendency is marked if aquagel is used in excess, in which case it gives up its water quickly and in some instances has been found caked behind the pipe. These troubles require constant correction by the mud engineers; a new material, called "Baroco," is used to offset the effect of salt on mud viscosity.

The excessive heat has required special systems for cooling the mud. Where there is ample space for mud ditches and pits the mud can be circulated and sufficiently cooled by the time it again reaches the suction pipe of the slush pumps. In other cases, where there is a lack of room, various forms of spraying systems must be used.

PRESSURE COMPLETION OF WELLS IN THE FITTS POOL.—K. R. Teis, before Am. Petrol. Inst., Tulsa, 1936.

The author first describes briefly the characteristics of the Fitts pool (Oklahoma); then describes the application thereto of pressure drilling, using water or gas rather than mud-laden fluid; points out the advantages and disadvantages, with descriptions of special equipment used; and concludes that the additional expense (approximately $3.00 per ft.) over conventional drilling is justified by results obtained.

Pressure-control drilling as practiced in the Fitts pool is essentially as follows: The mud-laden fluid of the conventional rotary process is replaced with either water or oil. This lighter-weight fluid is aerated with gas, so that the pressure thereby imposed against the formation being drilled is materially less than that existing in the formation. As a result, the well is kept alive during the drilling-in period, which permits progressive testing of the well's productivity and places the well in a condition such that penetration of additional oil- and gas-bearing zones brings about measurable increases in oil and gas produced while drilling.

Substitution of the lighter drilling fluid for the heavier mud-laden fluid makes necessary mechanical prevention of blow-out. This is accomplished by packing-off around the rotating drill pipe.

Gas in and out of the well is accurately metered, and oil production carefully gaged. Through these measurements it is possible to detect increases in production of oil and/or gas, to log the depth of the increase, and to determine the magnitude thereof by actual production tests. The advantages are: (1) Accurate logging of pay zones as to position in the producing section and as to productivity. (2) Elimination of the hazard of mud intrusion. (3) Reduction of bit wear. (4) Increased drilling speed. (5) Cleaner samples, more accurately logged. (6) More accurate determination of water-bearing strata. (7) Commercial status of well known at any depth while drilling in.

Its principal disadvantages are: (1) Increased cost of drilling due to: (a) Additional rigging-up expense. (b) Investment in additional equipment. (c) Increased down-time due to testing, snubbing operations, etc. (d) Increased labor expense. (2) Increased danger from caving formations as a result of reduced back pressure and absence of wall-building qualities in circulating fluid.

The chief value of the process in the Fitts pool lies in the fact that it permits of accurate logging of the productivity of the deeper pay zones.

DEEP-WELL DRILLING PROBLEMS AND THEIR SOLUTION.—K. C. Heald, before Am. Petrol. Inst., Div. of Production, Pittsburgh, 1936; (OIL WEEKLY, vol. 81 (1936), No. 13, p. 19).

Only by the discovery of new oil fields can we postpone the evil day when we must either depend on imported petroleum or on synthetic fuels and lubricants. Where are these new fields to be found? Not much is now looked for in the way of great discoveries in the shallow sand areas of the Appalachian, Mid-Continent, Texas or California regions. There remain the deep formations in the regions that are now either oil bearing or are suspected of containing deep oil pools. For instance, in parts of southwestern Oklahoma the celebrated Wilcox sand is probably 16,000 ft. or more below the surface, and in Texas, Louisiana and California rocks of the same age and presumably of the same character as those that elsewhere carry oil are believed to exist at depths of 20,000 or 30,000 ft.

If the question of obtaining oil from such depths is not now urgent, it may become so in the future, and will raise problems of greater import than now confront drillers who are penetrating relatively shallow pools. A major problem will be the monetary risk; a dry 10,000-ft. hole represents a major financial calamity. Hence the geologists and the geophysicists must be more than ever sure of their facts and their deductions. However, only the drill can furnish a decisive answer, and the problem of deep drilling becomes an engineering problem. It is now possible to sink oil wells to a depth of somewhat more than

CALIFORNIA MARCHES ON!

ALL DEPARTMENTS of the California petroleum industry are entering a period of greater activity than has existed for a decade. More wells are draining California fields today than ever before, and drilling increases as the search for new fields continues.

The fourth edition of the Annual Review Number of Petroleum World will be published in August, and contain an accurate, detailed account of the progress of the industry to date.

New features include a dry hole record of every wildcat drilled in California up to and including 1935, with a micro-paleontological report by a special authority of the information available on each well. This record of dry holes has never been published before—vital and important information every oil man should have at hand.

Manufacturers selling equipment in California can buy permanent and forceful advertising in the Annual that keeps sales messages alive for a year. Write for rates and further information.

PETROLEUM WORLD

Los Angeles • San Francisco • New York

ANNUAL STATISTICAL REVIEW NUMBER

10,000 ft.; beyond this depth is an unknown field. Equipment is now available that is strong enough to permit rotary drilling to 15,000 ft., and cable tool drilling to even greater depths. There are, however, certain difficulties; the most obvious obstacle to reaching great depths with cable tools is that the driller will "run out of hole," meaning that he is forced to set so many strings of pipe, either to exclude water or to keep the hole from caving, that the diameter of the hole becomes too small to allow further operations. The remedy is to be found in methods for sealing water sands and preventing caving without setting pipe; much can be done in these directions by methods that are now being developed.

Other difficulties to be met and conquered include avoidance of crookedness of hole, which is much more serious in deep than in shallow wells. Another serious difficulty is getting through extremely hard formations that may be encountered at great depths; here the diamond drill must be called on. Heaving shale may be controlled by keeping water away from it. Regardless of the character of the rocks the weight on the rotary bit must be controlled with great care. The drilling mud must be vigilantly watched to circumvent blowouts. The study of the dips of formations is of high importance; the Lyon and the Macready methods developed in California make it possible in many instances to determine dips (approximately) from a single core.

One of the great dangers in rotary drilling is that good oil pays may be overlooked. To prevent such an oversight the first precaution is to core generously; the second is to make drill stem tests of showings even though they seem to be unimportant; and as a further precaution it is now customary to run a test with the electrical logging method.

Light Portable Rotary Rigs for Shallow Fields.—B. Mills, in OIL WEEKLY, vol. 81 (1936), No. 8, pp. 25–26.

Use of small portable rotary rigs have materially reduced development costs in two shallow West Texas fields producing from lime formations between 2,500 and 3,000 ft. The outfits used in these developments consist of a draw-works, motor, transmission and control mounted on one set of skids, which in turn is mounted on a 2½ ton truck; the main unit weighs about 13,000 lbs. and is moved into the position that the draw-works would normally occupy. A 25/65 h.p. electric motor is mounted with the unit; electric current is available from commercial power lines. With a 4-inch drill pipe wells can be drilled to 3,000 or more ft. An 84-ft. steel derrick is used and two 30-ft. joints of drill pipe are pulled at a time. The average well cost is $14,000 to $17,000, including $1,200 for bits, $550 for electricity, labor around $2,800 and depreciation $1,000.

The portable rotary outfit has been especially valuable in reducing the cleaning-out time after shots. It formerly required from two to three weeks to clean out the average well with a bailer. With the present method it is possible to clean out a well in two or three days. A gas or air compressor is hooked up with the drilling outfit and the hole cleaned out in record time. Oil is first circulated with the slush pump in the usual manner. A slug of gas at a slightly higher pressure is then circulated behind the oil. The gas aerates the column and gives a much higher velocity than could be obtained with a full fluid column. The intermittent slugs of oil and gas rapidly force the cuttings from the hole. The compressor operates with an intake pressure of 150 to 400 pounds and a discharge pressure of 700 pounds. Since the pump and compressor do not operate at the same pressure, it is best to use them intermittently to prevent one from stalling or affecting the other.

The small portable rotary has overcome many of the objections to use of heavy rotary outfits, and the smaller capital outlay and operating cost make this type of development promising in a number of shallow West Texas fields.

Oil Well Operation

Back-Side Crank Pumping and Catenary Rod Lines.—R. E. Bridges, before Am. Petrol. Inst., Tulsa, 1936.

This paper is divided into three sections. The first section points out the advantages to be gained by close attention to the details of setting and alignment of rod-line equipment connected to back cranks of individual pumping units.

The second section deals with the proper balancing of loads on the unit when from one to four jack wells are pumped from it. Torque on the unit shaft is used as a basis for analyzing these loads. It is shown that the best operating condition is attained when the torque curves are smooth, with a minimum difference between low and high torque.

The third section emphasizes the savings to be derived from adoption of the catenary-curve principle in pull rod-line installations. The two definite economies effected are the reduction of friction and elimination of hold-downs in low places. Formulas and examples are given to show the relation between the various factors encountered in the design of sagging rod lines.

Life of the equipment in back-side hook-ups and rod lines will depend to a great extent on accuracy of alignment and careful attention to details in the original installation; on proper balancing of loads on the unit; reduction of friction as much as possible; and occasional inspection to see that alignment is maintained. It will depend largely, also, upon adherence to the old adage that "no chain is stronger than its weakest link." Breakage of the weak link may seriously damage other parts of the rod-line system; so a very careful inspection should be made of all second-class material to be used to see that it is in good condition.

Re-pressuring Lime Areas in Kentucky.—Newell M. Wilder, in OIL WEEKLY, vol. 81 (1936), No. 13, pp. 31–36.

The problems encountered in re-pressuring limestone oil-bearing formations are interestingly different from those met with in sand and shaly sand reservoirs. The difference lies in the fact that the sandstone type of reservoir is made up of different sized sand grains and the porosity, due to this granular structure, is generally continuous throughout the formation. On the other hand, limestone rock lacks the original granular structure necessary for porosity; such porosity as it has is due to the leaching action of solutions that form cavities ranging in size from a pin point up to two or three inches in diameter. Some limestone formations are so uniformly leached that they resemble honeycomb. This leaching action in limestones, however, is not generally uniform, so that there is a lack of continuous inter-connection between the oil-containing cavities, and permeability charts show great differences from one foot to another. From this circumstance it has happened that new wells, drilled between old producers making less than a barrel a day after 17 years, have yielded at a rate approaching that of the old wells when they were first drilled.

From this it is clear that the drainage of a limestone reservoir does not conform to radial flow, as is generally the case with sandstone reservoirs, and this fact has to be considered both in the spacing of new wells and in working out a spacing pattern for re-pressuring purposes. Instead of blindly following the conventional five spot or seven spot pattern, the spacing should be fitted to directional flow trends as determined by experimental pressure wells. This principle is being followed with success in the limestone producing areas in eastern Kentucky.

Portable Well Servicing Equipment.—R. E. Gignoux and Wendell M. Jones, in PETROLEUM WORLD (CALIF.), vol. 33 (1936), No. 5, pp. 47–54.

It is now being generally concluded that it is uneconomical to install at each oil well equipment for both servicing the well and lifting the production. The practice of eliminating the standard end that has been used for both servicing and lifting began with the shallow wells and is spreading to the deeper ones; the standard end is replaced by individual pumping engines and servicing is done by a portable hoist that can serve several wells in the same area. A recent case is cited where a portable hoist, which cost $6,000, allowed a saving of a like amount in equipment of three wells. Several manufacturing firms are now specializing in these outfits.

Natural Gas

Means of Maintaining the Efficiency of Large Gas Transmission Lines.—R. M. Laulkere, before Natural Gas Dept., Am. Gas Assoc., Dallas, 1936.

The maintenance of the efficiency of gas transmission pipelines is a matter of great importance to the natural gas industry. The carrying capacity of a new clean pipe can be calculated from flow formulas, but in use the pipe may not stay clean; at various points there will be an accumulation of foreign matter that creates obstructions. Among such are dirt, dust, and other solids; water and other liquids, and natural gas hydrates; these last occur under a gage pressure of 400 lbs. when the temperature drops to 52 deg. F., and on occasion may become serious.

Internal corrosion is the principal factor tending to reduce gas pipeline efficiency. The various circumstances giving rise to internal corrosion by gases containing controlled concentrations of hydrogen sulphide, oxygen and water have been made the object of a research by the Southern California Gas Co. So far as this research has proceeded the following conclusions appear to be warranted:

Natural gas considerably unsaturated with water vapor and containing both hydrogen sulphide and oxygen is not corrosive to steel, while the same gas carrying free water is very corrosive; gas that is oversaturated but containing no hydrogen sulphide nor oxygen is not corrosive; oversaturated gas containing hydrogen sulphide but no oxygen is very much less corrosive than if oxygen is present; gas containing oxygen but no hydrogen sulphide is corrosive when oversaturated; if natural gas containing hydrogen sulphide and oxygen is alternately over and undersaturated it is relatively corrosive to steel in proportion to the time of oversaturation, air containing free water is very corrosive to steel, but air is not corrosive if considerably below saturation.

Maintenance of flow efficiency of a pipeline should be based on a careful test of the capacity of the line when it is first installed. This will afford a reference point by which subsequent decreases of efficiency can be measured. Introduction of solid materials such as dirt and dust may be guarded against by scrubbing the gas before it enters the line, and these scrubbers should be intelligently designed. Moisture content can be kept down by atmospheric cooling or artificial refrigeration systems, or if these fail the dew point may be lowered by the use of calcium chloride brine.

While prevention is better than cure, the problem may arise of cleaning out a line that has been impaired by internal corrosion. An operation is described in which 5-mile sections of a corroded 20-inch pipe were cleaned by introducing three sacks of steel shavings and lathe cuttings at one end of the section and blowing this material through to the other end with gas under a pressure of 350 lbs. to the square inch. The cleaning effect was quite marked and a substantial gain in efficiency was noted.

Prospects of Polymerization of Natural Gas in Texas.—A. L. Foster, in NAT. PETROL. NEWS, vol. 28 (1936), No. 17, pp. 43–48.

Under the head of "Polymerization Applicable to Natural Gas Only in Concentrated Gas Areas," it is remarked that polymerization can be undertaken successfully only where there are large concentrations of either natural or refinery gas which is rich in propane and butane, particularly the latter; in some opinions propane is less suitable than butane because propane requires higher pressures and temperatures for polymerization.

Opinion varies among technologists as to the through-put capacity of the smallest practicable commercial unit. It has been said that a capacity of 2,000–3,000 bbl. of liquefied butane daily is necessary for profitable operation, but owing to the experimental status of the process present opinions must be regarded as tentative. Competent authorities have estimated that for a plant producing 400–500 bbl. of gasoline per day, the unit cost must be of the order of $1,000 to $1,300 per bbl. Such a plant would charge the equivalent of about 1,000 bbl. of liquid butane per day. These estimates are also tentative, and the same is said of amortization costs.

In any case, polymerization plants using natural gas must be located in fields where there is a large quantity of gas available, and this gas must be rich in propane and butane. This seems to narrow the field to the Texas Panhandle, which has the largest volume of gas, and East Texas, which seems to have the richest gas. Informed observers estimate that the East Texas field could ultimately produce about 300,000 gallons of butane a day for polymerization, the yield of polymerized gasoline being estimated at 60 percent. Available figures indicate that the daily yield of butane from the Panhandle field may reach 330,000 gallons, with twice as much propane. Much more will doubtless be learned when the experiment of the Humble Oil Company, now under way, has produced some tangible results.

Application of Multicylinder Gas Engines.—D. G. Kingman, before Am. Petrol. Inst., Tulsa, 1936.

While multi-cylinder engines have long been used as a source of industrial power, they have only recently been used in the production of oil. This use is increasing, and it has in general been successful, largely because of an increasing conception on the part of the operators of the problems involved in the application of this type of prime mover and a willingness on the part of the manufacturers to provide engines particularly suited to the conditions encountered.

The application of multi-cylinder gas engines cannot be undertaken as a general policy applicable to all conditions, as in many instances the use of gas engines is not economically justified. Every case must be considered by itself, and all the influencing factors given careful consideration, before deciding upon the type of motive power to employ.

Natural Gas as a Chemical Raw Material.—Sidney Born, before Natural Gasoline Assoc., Tulsa, 1936 (OIL WEEKLY, 1936, No. 20).

Natural gas is one of the most abundant of raw materials for chemical manufacturing. It is also one of the least expensive; at 10 cents per 1,000 cu. ft., a ton of natural gas would cost about $4.00, which may be compared with $8.00 for common salt and $16 for sulphuric acid.

Among products that are or have been manufactured on a commercial scale from hydrocarbons found in natural gas is amyl acetate, which has a wide use as a solvent. It is made from pentane. Another widely used substance is ethylene glycol; this substance is made from ethylene (which can be derived from natural gas hydrocarbons) and is sold under the name "Prestone" as an antifreeze compound for automobile radiators; other compounds of ethylene find extensive use as solvents. Some very good rubber substitutes are being made from ethylene dichloride; one of these is sold under the name "Thiokol" for making rubber hose and similar uses. Ethylene has been used as a source material for ethyl ether, and the operation even now would be profitable if the gaseous products of cracking processes were used. The Standard Oil Development Company is working out a process for making higher alcohols from other unsaturated hydrocarbons.

When natural gas is burned with a restricted supply of air there is obtained a variety of substances, including formaldehyde, methyl alcohol, acetylene and unsaturated hydrocarbons. There is now in operation in Oklahoma a plant for producing commercial quantities of formaldehyde and methyl alcohol by this process.

The developments here listed hardly scratch the surface of the possibilities, and it seems that ample rewards await those who will build intelligently on the present foundation.

Pipelines

Measurement of Viscous Fluids.—H. V. Beck, in OIL WEEKLY, vol. 81 (1936), No. 13, pp. 39–41.

The orifice meter of the sharp square-edged type is admirably suited to the measurement of gases and non-viscous liquids, the variations being within the limits of accuracy of commercial measurement. With fluids of higher viscosity, however, the degree of variation increases, and may amount to 10 percent if the temperature changes appreciably during the process, so that it is impossible to determine the orifice constant unless the fluid viscosity has been definitely determined for the entire range of temperatures, and unless the fluid temperature during metering is definitely known.

In the effort to develop an orifice meter for viscous fluids with a substantially constant coefficient of discharge the author investigated the round-edged orifice, and a series of orifice plates with proper edges was produced by which the desired results were substantially accomplished. With these plates, using liquids with Reynolds' numbers above 1,000, the coefficient of discharge for the round-edged orifice is substantially constant at 0.855. On a 4-inch line, accurate determinations could be made on rates of flow as high as 750 bbl. per hour.

With orifices of this type the need for constant observation of the fluid temperature and for frequent sampling of the fluid for viscosity determinations would be eliminated. The orifice with the coefficient determined at the factory could be used in the field without corrections.

Rubber Pipeline Coating.—Elmer F. Schmidt, in PETROL. ENG., vol. 7 (1936), No. 9, p. 33.

About a year ago the Lone Star Gas Co. installed a 100-ft. section of rubber-coated 10-inch pipe in one of their lines about 10 miles southwest of Waxahachie, Texas. The soil at this location was known to be highly corrosive. This coating was the result of five years of research by The B. F. Goodrich Co. The rubber was vulcanized to the steel pipe at the Goodrich factory in Akron, Ohio, leaving about 10 inches of the pipe bare at each end. Five 20-ft. sections of the coated pipe were welded into a continuous section at the location where it was to replace a 100-ft. section removed from the line.

The joints at the welds were protected with unvulcanized rubber sleeves which were cemented to the pipe and extended several inches over the rubber coated pipe. This sleeve was then wired firmly with several bands of wire, in the expectation that the soft rubber would in time freeze to the pipe and vulcanized coating, and thus protect the ends.

Recently this section of pipe was removed for inspection. The factory vulcanized coating was in perfect condition, but the soft rubber sleeves at the joints had not gripped the pipe sufficiently to exclude water and at

these places there was some evidence of rusting and pitting. The uncovered joints were given a new type of coating that is expected to be capable of affording complete protection. The inspection will be repeated annually, and it is anticipated that if the new joint coating performs as well as the rubber coating, 100 percent protection can be obtained by this method.

CONTINUOUS TAKE-UP OF PIPELINES.—Barry Federman, in PETROL. ENG., vol. 7 (1936), No. 9, p. 38.

In anticipation of an expected increase in the number of pipelines taken up for reconditioning, a contracting corporation is developing a method for easy removal of buried pipe from the ground. As applied to a 4-inch line under 18 in. of soil, one method consists of placing around the pipe a ⅝-in. cable with ¾-in. collars strung around it to act as rollers; when pulled down the right of way by a tractor this serves to loosen the soil around the pipe. Attached to the same tractor is a sled which lifts the pipe to the surface, ready to be cut into sections. The method appears to be inexpensive and expeditious.

Petroleum Refining

NEW METHOD OF REFINING GASOLINE OBTAINED FROM LIGNITE.—B. Kwal, in ACTUALITIE CHIM. IND., vol. 35 (1936), No. 5, pp. T. 180–T. 190.

The gasoline obtained by destructive distillation of lignite contains a large proportion of diolefines, the removal of which by sulphuric acid would entail large refining losses. In the author's process the cracked lignite gasoline is first mixed with ozonized water by which the diolefines, the hydrogen sulphide and a part of the thiophene are oxidized. In a second operation the gasoline is treated with a natural earth ("carlonite") and ozonized water which completes the removal of the thiophene along with certain resins and coloring matters. In further steps the gasoline is washed with water and with caustic soda to remove acid products, and is finally treated with doctor solution to remove mercaptans.

INSTRUMENTATION IN OIL REFINING.—A. C. Proctor and Gustav Egloff, before Am. Petrol. Inst., Tulsa, 1936.

One of the important developments in the processing of oil has been in automatic control. This development has brought about marked economic savings due to producing better and higher yields of the more valuable products from crude oil. Automatic control plays an important part in operating crude-oil stills, cracking units, and combined topping-cracking units which have been built in capacities ranging from small to large (up to more than 30,000 bbl. per day of crude). At present an atmospheric distillation unit is being designed of a capacity of about 65,000 bbl. of crude oil per day.

In the days of batch-shell still refining and cracking operation but a few years ago, a single mercury thermometer and an indicating pressure gage were deemed sufficient. The control of operation was by hand, with no automatic devices for determining fluid (liquid and gas) temperatures, pressures, flow rates, or liquid levels in the system. At the present time some refining units, in order to insure accurate control are equipped with more than 300 control or indicating points, which are serviced by highly-skilled instrument men.

The authors discuss at considerable length the construction and uses of thermometers, pyrometers, flow meters, pressure gages, pressure controllers, liquid-level controls and control valves.

A NEW GERMAN CRACKING PROCESS.—E. L. Lederer, in PETROLEUM, vol. 22 (1936), No. 17, pp. 1–3.

A new cracking process is described which depends essentially, on the "three-phase principle," the novelty consisting in the succession of the phases, which is in the following order: "higher, lower, and at the most favorable cracking temperature." Stress is put upon introduction of the feed oil at the most favorable spot. The circulation principle is adopted in order to obtain a milder cracking result, due to the presence of a large volume of previously cracked products. Intake of the feed oil, with consequent reduction of temperature, occurs at the place and time when the material is in the zone where there is greatest likelihood of formation of gas and coke. The oil requires about 15 minutes to pass through the three-phase cracking still; the proportion of fresh feed oil to cracked product in circulation is one to six. Working with a Roumanian residue the following yields were obtained:

Gasoline fraction	54.5%
Light oil	6.0
Asphalt	27.6
Gaseous products	8.9
Loss	3.0

DESULPHURIZING PETROLEUM FRACTIONS UNDER PRESSURE OF HYDROGEN.—P. W. Putschkow, in PETROLEUM, vol. 32 (1936), No. 32, pp. 1–7.

In the hydrogenation laboratory of the I. G. I. Academy of Science at Moscow, the author built an experimental apparatus in which to desulphur mineral oils in vapor phase with hydrogen. The reaction vessel consists of a pressure cylinder filled with fragments of silica gel impregnated with molybdenum sulphide as a catalyzer. A heavy fraction (end boiling point 335 deg. C.) of a Russian petroleum containing 1.01 percent sulphur was vaporized through the apparatus at 400 deg. C. under 50 atmospheres pressure. The sulphur content was reduced to 0.125 percent. The hydrogen consumption amounted to 0.25 to 0.30 percent by weight, figures on the starting material; the yield of desulphured oil was 96 to 99 percent. The molybdenum catalyzer stood up very well. Gasoline fractions may be desulphurized to below 0.1 percent sulphur at a pressure of 25 atmospheres; the most suitable temperature is also 400 deg. C.

SOLVENT EXTRACTION OF RESIDUES BY THE LIGROIN-ETHER-ALCOHOL PROCESS.—A. Flachs, in ANN. MINES ROUMANIE, vol. 19 (1936), No. 5, pp. 227–232.

The solvent extraction of Roumanian residues of paraffinous crude oils by the ligroin-ether-alcohol (L.E.A.) process is described. The residue is first treated with ethyl-ether in the proportion of one to one. This ethereal solution is then cooled to below 0 deg. C. and treated with ethyl alcohol. The result is a precipitate consisting of paraffin, pitch and asphalt; the lubricating oil fraction remains in solution. The proportion of alcohol is one to one and one-half for precipitation and one to one-half for washing. The precipitate is filtered off and the alcohol-ether is separated from the lube and vaseline fractions by distillation. The solid precipitate, containing the solid paraffins, pitch and asphalt, is treated with ligroin, which separates the asphalt from the solid paraffin and the pitch. After distilling of the ligroin the residue is treated with pure alcohol, which separates the paraffin from the pitch.

Asphalt and Tar

CHANGE OF PENETRATION WITH TEMPERATURE OF VARIOUS ASPHALTS.—I. Bencowitz and E. S. Boe, in IND. ENG. CHEM., analyt. edit., vol. 8 (1936), No. 3, pp. 157–161.

The susceptibility of asphalts to temperature changes is probably the most important characteristic of these substances. To be able to evaluate this coefficient with precision is most essential both for purposes of identification and for revealing intrinsically the suitability of a given asphalt for a desired purpose. Though many attempts have been made to arrive at some method of determining this factor of susceptibility, no satisfactory procedure has as yet been worked out. In this investigation a simple equation, $p=A+B\times C^t$, was found to express the variation of the penetration of thirteen asphalts with the temperature.

Several sources and methods of processing are represented in the asphalts which were studied. The equation can be solved when three penetrations obtained with the same weight and for the same period of time at different temperatures are known. By means of this equation a simple index, p_2-p_1, was found to represent adequately the order and the relative magnitude of the temperature susceptibility of the thirteen asphalts. The temperatures, expressed in centigrade degrees, are so chosen that $t_3-2t_2+t_1=0$ i.e., 50 deg., 25 deg., and 0 deg. C., or 40 deg., 20 deg., and 0 deg. C. This limitation is not essential for the solution of the equation, but the solution is simplified a good deal if the suggestion is followed.

By means of this equation it is possible to represent the change of penetration with temperature throughout the working temperature range. The differential dp/dt represents the true susceptibility. However, to conform to the usage of expressing similar variations of other important characteristics of matter, such as the coefficient of compressibility, etc., we may define the susceptibility of asphalts by the coefficient $1/p\times dp/dt$. This can be advantageously used for classification of all asphalts, regardless of their sources or methods of processing, providing the above empirical equation, or a similar equation, expresses the experimental variation of the penetration with temperature.

Unfortunately, this coefficient is not a constant. The authors suggest, therefore, as an

approximation, a constant factor to represent the susceptibility, the definite integral of dp/dt between the limits of the desired temperature. This integral is equal to p_2-p_1. It is further shown that the ratio of penetration obtained with different weights at different temperatures is practically constant. This makes it possible to use penetration of a hard asphalt obtained with 200 or 250 grams and that of a soft asphalt with 50 grams and the respective indexes are nevertheless rigorously comparable.

ASPHALT CUTTING.—Gordon MacLean, in REFINER, vol. 15 (1936), No. 3, pp. 187–188.

By the use of turbo-mixers batches of cutback asphalt can be perfectly blended in 15 minutes, even in 50-ft. tanks. This is in striking contrast to what is observed in many refineries, where reliance is placed on agitation with air; in such cases it is a difficult matter to move the heavy asphalt from the bottom or to get the lighter solvent down; hence 10 hours are generally required to make a blend, and cases have been known where it took four days to get the material blended and adjusted to a point where specifications could be met.

The fastest and most thorough equipment for this purpose, from the data at hand, is a type equipped with three centrifugal turbine type impellers on the same vertical shaft. The horsepower is low, and taking a probable mixing time of fifteen minutes into consideration, the horse-power-hours for blending large batches reaches a ridiculously low figure.

For blending operations, it is necessary to move large volumes of liquid, and this type of equipment may actually pump, through the three impellers, as much as 90,000 gallons per minute. If all parts of the tank are reached by the streams from the impellers, a running time sufficient to circulate the entire tank contents from four to six times will assure a uniform batch with a good safety factor. Samples taken from all parts of a tank so agitated will be uniform.

If the solvent is run in first, and the asphalt is then pumped in over the lower impeller, no free asphalt ever gets to the bottom of the tank, and solvent loss is decreased because it is an integral part of the cutback by the time it has become hot. By using this method, a sample may be taken only a few minutes after the last of the asphalt is in, for the blending has been going on during the filling of the tank. With such a process the burden of getting shipments out is thrown on the pumps, since the cutting and testing time is reduced to such a low figure.

With the assurance that cutbacks can be turned out rapidly in any quantity, the necessity for large storage of finished goods is removed, which affects the amount of capital tied up and gives a degree of flexibility to the plant which is very desirable.

Petroleum Uses

TESTING FOR SLUDGE FORMATION IN MINERAL TRANSFORMER OIL.—F. M. Clark and E. A. Snyder, before Am. Soc. Testing Materials, Atlantic City, 1936.

It has now been recognized that the "life test" for transformer oils is based on an erroneous assumption that all oils, once oxidation has reached the sludge-formation stage, deposit sludge at approximately the same rate. Experience now indicates that it is necessary to take account not only of the time of the first appearance of sludge, but also the rate at which sludge is subsequently formed. On this basis a new test has been worked out, in which identical samples of the oil are heated in test tubes under standard conditions for different lengths of time at 120 deg. C., and the quantity of sludge formed in each sample is noted. When the test is carried out in the presence of copper a decision can be made in as short a time as nine days with an average American transformer oil; in the absence of copper at least 35 to 45 days are required.

TESTING DIESEL FUEL FOR HIGH-SPEED AUTOMOTIVE VEHICLES.—A. Hagemann and Th. Hammerich, in OEL UND KOHLE, vol. 12 (1936), No. 18, pp. 371–381.

Diesel fuels for high-speed autobuses and trucks should pass the following tests:

A. Commercial data
   1. Flash point, important for the safety of storage and transporting.
   2. Contents of water, important for the prevention of corrosions during storage.
   3. Purity, particularly in respect to mechanical impurities.

B. Operating data
   1. Solidifying point as a characteristic of the flow of the fuel by its own gravity.
   2. Filtering ability, especially at low temperatures.
   3. Corrosion.

C. Operating data
   1. Viscosity as a characteristic for the flow and dispersing property of the fuel.
   2. Ignitability.
   3. Coking properties as a guide for judging the inclination of the fuel to carbonise inside and around the nozzle.
   4. Calorific value.
   5. Effect on the smoking point as a guide for judging the combustion properties.

Since for the other properties reliable tests are in use, only the question of the filtering ability, corrosion, ignitability, coking properties and effect on the smoking point are considered in this paper.

For testing filtering ability an apparatus has been developed in which the oil, at a certain temperature, is forced under a pressure of 0.5 atmosphere through a system of copper screens of a certain mesh; the time required to pass 200 cc. of oil is taken as the measure of filtering ability.

Corrosion is determined by partially immersing weighed strips of sheet copper in the oil at 50 deg. C. for 24 hours; the strip is then cleaned, washed with 10 percent potassium cyanide solution, dried and weighed; the loss in weight represents corrosion. For a check, the same test is carried out with strips of zinc. Ignitability is determined in a special Diesel motor constructed by Deutz; the motor is started by a separate power source, adjusted to 1,000 r.p.m. and air is drawn in at a variable rate. By a special device the injection of oil is throttled to a point where ignition just fails. Tests made with this engine correspond satisfactorily with those made with the C F R engine.

The coking property is tested by placing five grams of oil in a beaker, which is set in an autoclave heated to an even temperature for two hours under an initial air pressure of 20 atmospheres. The residue in the beaker is tested for its content of asphalt and coke.

The smoking point is related to the tendency of the oil to form asphalt, coke and soot. An irreproachable determination of the smoking point is difficult, but some progress has been made in devising an apparatus by which the smoke and soot particles in the exhaust gases can be detected by an electrical photometer.

Petroleum Substitutes

COMPARATIVE ADVANTAGES AND DISADVANTAGES OF THE BERGIUS AND FISCHER PROCESSES FOR SYNTHESIZING PETROLEUM.—Ch. Bertholet, in ACTUALITE CHIM. IND., vol. 35 (1936), No. 4, pp. 768–791.

At the present time, it can be said that the preparation of synthetic petroleum fuels has been technically solved. The two processes by which this is accomplished—the Bergius and the Fischer—have been definitely industrialized and are furnishing a gasoline which has the same physical and chemical characteristics as gasoline from natural petroleum, and the use of the synthetic fuel requires no change in the construction of existing internal combustion engines.

The object of the present study is to establish a parallel between the Bergius and the Fischer processes, and the conclusion is reached that the two methods are complementary and not competitive. The Bergius process is applied directly to coals having at least 22 to 25 percent of volatile matter on which it fixes about 10 percent of its weight of hydrogen. On the other hand, the Fischer process is applied to any carbonaceous material from which producer gas or water gas may be obtained, or to a gaseous mixture which corresponds to the formula $CO+2H_2$.

Present information does not admit of an exact statement of costs, but it is perhaps not far from the truth to say that the cost of a ton of gasoline produced by the Fischer process at the rate of 50,000 tons a year is 2,500 francs; by the Bergius process the same ton costs 3,000 francs.

On this basis, it appears that the Fischer process is commercially practicable if sheltered behind a tariff wall that imposes on imported gasoline a duty of 96 francs per hectaliter (about 16½ cents a gallon). If this price spread could be maintained by finding a substitute for all the revenue now obtained from imported petroleum imports, such countries as England, France and Germany could make themselves completely independent of imported oil. However, obtaining this extra revenue will be a difficult matter, and it is unlikely that the development of synthetic gasoline will be pushed to an extreme in these countries.

FUEL OILS IN EAST AFRICA.—Giovanni Coppa-Zuccori, in RIV. ITALIA DEL PETROLIO, vol. 4 (1936), No. 36, pp. 5–8.

The author, having in mind the lack of sources of petroleum under Italian control, takes up the question of finding a substitute for the gas oils used as Diesel fuel; such substitutes must fulfill three conditions: they must be capable of use in Diesel engines of the present design, they must be obtainable in large quantity, and the price must be relatively low. Under present conditions, as viewed from the

© Sovfoto

Nati, the Soviet Auto-Tractor Scientific Institute, has constructed a gas-generating automobile which runs on wood fuel. The gas generator is fixed in a carrying frame on the rear of the machine. Thirty kilograms of wood fuel are used for every hundred kilometers traveled.

Italian standpoint, these conditions are fulfilled by the vegetable oils which can be produced in East Africa.

Reference is made to extensive tests showing the adaptability of peanut oil for Diesel use, and it even has some advantages over gas oil, such as easy starting in the cold and anti-knock quality. Aside from peanut oil, chief among other vegetable oils that come into consideration is cotton-seed oil. Both these plants are adapted for cultivation in East Africa, and for the purposes of Italian economics the extensive cultivation of both is of great importance; both furnish by-products that are valuable stock feeds, and, in addition, cotton supplies an indispensable raw material for textiles. The area of land in Somali and Eritrea suitable for these two crops is not exactly known, but is certainly not less than a million acres and undoubtedly is much more. With every pound of cotton fiber there are produced two pounds of cotton-seed oil. By an appropriate tariff policy in regard to cotton lint and the oil cake, the price of the oil might be kept low enough to admit its use for fuel.

The oil content of peanuts is double that of cotton-seed and the value of peanut oil cake as a stock-feed would go a considerable way in making it possible to use the oil as a Diesel fuel. In any case, the use of these oils for fuel purposes should not prove more uneconomic than the use of anhydrous alcohol, which is now regularly used by many countries that, like Italy, have no native petroleum resources.

Petroleum Reserves

Productivity Index.—M. L. Hoider, before Am. Petrol. Inst., Tulsa, 1936.

Various methods of determining the ability of an oil well to produce are discussed. The "productivity index," which is defined as the number of barrels of oil produced per day per pound differential between static and flowing bottom-hole pressure, is discussed; and methods of determining it are outlined. Data on a number of wells in various pools in Oklahoma are presented. A discussion of the various measures of the relative ability of a well to produce shows the productivity index to be superior. Although it is felt by some that the productivity index is not a constant with rate of production, data presented indicate that if the tests are properly conducted, the productivity index is constant.

In the writer's opinion, the use of productivity index has advantages that far outweigh the disadvantages. Much has been learned in the past year or two concerning the relationship between bottom-hole pressure and rate of production; and, with continued study, it seems almost certain that it will soon be entirely practical to determine satisfactorily the productivity index of a well, and to use such indices in the allocation of production. The productivity index is a measure of a well's relative ability to produce oil and, therefore, will not conflict with the laws of states requiring that the well's ability to produce be a factor in allocation.

Petroleum Economics

A New Phase of the Struggle between Rail and Road.—Oskar Tokayer, in Petroleum Press Service, vol. 3 (1936), No. 19, pp. 149–150.

In Austria, as in certain other countries, the government has adopted the policy of trying to retrieve losses suffered by the railways during the years of economic depression by severely limiting the transport of goods by road. Apart from heavy taxation of vehicles and motor fuel, drastic administrative restrictions have been imposed upon commercial road transport. Minimum scales of charges and maximum distances have been prescribed; and, since road transport still survives under these burdens, a whole series of petty regulations has been introduced to render its profitable operation impossible.

These measures have succeeded in severely interrupting normal development of goods traffic by road but no favorable reaction upon railway finances has resulted, and so the government has felt itself obliged to take the next logical step to prevent further deterioration of the position of the rail carriers. Regulation of rates and conditions under which goods may be transported by trucks operated by competing carriers having failed to restore business to the railways, it is now proposed to subject even private trucks to the same restrictions as public transport. Under this proposal Austria will enjoy (?) the distinction of being the first country in the world to place the delivery of goods by private firms in their own vehicles under official restrictions and compel such firms to bear the same burdens as the commercial carriers. The proposition has been interpreted to mean that even farmers could be forbidden to bring their produce to town with their own horse and wagon. (The idea seems indeed a novel one, but the point involved is the social-economic question of whether the public as a whole will be better served by preserving or destroying the railroads. Ed.)

Some Economic Aspects of Proration.—John M. Lovejoy, before Independent Petroleum Assoc., Tulsa, 1936.

The practical aspects of proration may be viewed in the light of the following considerations:

The industry completed 15,000 oil wells in 1935. It is reasonable to assume that we will complete an equal number this year. We can also assume that 10,000 of these completions are large enough initially so that they must be prorated. How is the industry to absorb the production from these new wells? Firstly, through the decline of old wells and abandonments. Secondly, through increased demand. Thirdly, through deeper proration of all wells. In looking for the decline we are limited to the 290,000 odd wells which include all the small wells, strippers, and edge wells. The estimated production from this group is about 900,000 bbl. per day, or an average of three barrels each. After allowing for 5,000 of the 15,000 new wells to stem the decline, it is reasonable to assume that this group will decline some 50,000 bbl. per day in the period of one year. Assume an over-all increase in demand for the next year of three percent, or roughly, 150,000 bbl. per day. We have found, then, that through decline and through increased demand, we can assign 200,000 bbl. per day more at the end of a year to prorated wells, but we will have by that time 10,000 more wells to prorate. There are now some 50,000 wells prorated to 2,000,000 bbl. per day, or an average of 40 bbl. each. At the end of a year we will have 60,000 wells prorated to 2,200,000 bbl., or an average of 36 bbl. per well. Deeper proration and relatively diminishing returns appear to be inevitable unless we slow down the rate of drilling new wells.

As an immediate and pressing matter, the industry should exert all its influence to bring production in line with the Bureau of Mines

figures. Each state is naturally desirous of a larger share of the total markets. Each state believes it is entitled to a larger share. The government, through the Bureau of Mines, renders a great service in publishing each month the estimated demand, and after weighing all the facts they recommend a certain amount to be produced from each state. These recommendations are made at the request of the industry, and yet the industry apparently does not have sufficient wisdom to follow them. The continued small overage when translated into income to the individual producer means nothing, but in the aggregate it is a burden the industry cannot carry. Each state in setting its allowables must realize that if they take more, some other state must take less. If the several states will accept the Bureau's recommendations and enforce them, new life will be breathed into the Interstate compact.

It is essential that every operator understand this new concept of the oil industry. Restriction of flush production is true conservation and will perhaps ultimately result in recovery of immense quantities of oil not recoverable under old methods. The decline and abandonment of small wells is very slow, and except to the extent of this decline and of increased demand there is no outlet for new wells; at the present rate of drilling, room for new wells can be made only by deeper proration.

General

Salvaging 30,000,000,000 Bbl. of Crude.—Lester C. Uren, in WORLD PETROLEUM, vol. 7 (1936), No. 5, pp. 240–245.

A large part of the original endowment of petroleum in the oil fields thus far discovered has been left behind in the reservoir rocks, unrecoverable by methods commonly used in practice. This residue is possibly of greater magnitude than the undiscovered reserve represented by fields that have not yet been penetrated by the drill. No doubt a large part of our future supply of oil products must come from this reserve. The fact is that current recoveries from existing fields seldom exceed 30 percent, and are often less than 20 percent.

The irrecoverability of this residual oil is more relative than real. Under present conditions so much oil is obtained from so many flush fields that the price is too low to warrant expensive recovery operations. It is true that some methods of recovery are commercially warranted at the present time, such as pressure maintenance, pressure restoration, gas driving, water flooding, and even oil mining. Most of these secondary recovery methods are still relatively inefficient, since they fall considerably short of securing complete exhaustion. The most efficient of all these methods is oil mining, which has been reduced to a practicable system in the Pechelbronn and Wietze fields. Oil mining means sinking a shaft by well-known mining technique to the oil formation, into which lateral channels are cut so as to afford the oil a far greater opportunity to flow out than is given by a narrow drill hole. In the author's opinion this will be the method of the future, when flush fields have become few and far between; it is probably applicable to many, if not most, known fields. The first cost of an oil mine will be high, but the high percentage of recovery will perhaps result in a comparatively low cost per barrel.

Salt-Dome Statistics.—George Sawtelle, in BULL. AM. ASSOC. PETROLEUM GEOLOGISTS, vol. 20 (1936), No. 6, pp. 726–735.

There are 141 known salt-domes in the Texas-Louisiana Gulf Coast. Three lie in what is called the Rio Grande Province (Duval and Brooks counties, Tex.); 77 lie between Jackson county and the Sabine River, and 61 in the Louisiana coastal district.

At the beginning of the present century 16 coastal salt-domes were known. By the discovery of the Spindletop field in 1901 the connection of salt-domes and petroleum deposits was demonstrated, and from 1922 on new domes have been discovered at the rate of 1 to 15 a year. The discovery of domes has been influenced by many factors, which are classified as follows:

Features or Prior Work Leading to Discovery	Texas	Louisiana	Total
Mound	16	10	26
Paraffine dirt	10	10	20
Gas seeps	17	16	33
Sulphur and/or sour water	13	1	14
Oil seeps		2	2
Gas and/or oil in water wells	3	3	6
Surface geology	9	1	10
Subsurface geology	2		2
Torsion balance	26	7	33
Refraction	14	31	45
Reflection	14	10	24
Pendulum	1		1
Magnetometer	2		2
Wildcat	1		1

Nineteen salt-domes have been found in marshes, 9 in lakes, and 11 "in marshes and lakes"; 33 have surface mounds and 13 of these have central basins. Cap rock has been penetrated in 43 Texas salt-domes and 39 Louisiana domes; on 2 domes (Pine Island and Gyp Hill) the cap rock is exposed at the surface. Salt has been penetrated in 47 Texas and 46 Louisiana domes; the presence of salt in the other 26 domes is inferred from gravitational surveys. Depth to salt or cap rock is capitulated herewith.

Cap Rock or Salt Penetrated (Depth in Feet)	Texas	Louisiana	Total
Less than 500	13	12	25
500–1,000	17	8	25
1,000–1,500	5	7	12
1,500–2,000	1	6	7
2,000–3,000	1	3	4
3,000–4,000	5	4	9
4,000–5,000	1	3	4
5,000–6,000	1		1
6,000–7,000		2	2
7,000–8,000	3	1	4
No cap or salt	33	15	48

Through 1935 the coastal salt-dome oil fields of Texas and Louisiana have produced 1,154,141,932 bbl. of oil. Of this, 942,586,244 bbl. were produced in Texas, and 211,555,688 bbl. in Louisiana. Ninety-three domes are now producing oil. Ten are producing gas and distillate. Ten domes formerly producing have ceased to produce. On four domes oil is being produced from overhanging salt or cap rock. Six domes are producing sulphur, and three are exhausted as sulphur producers. Rock salt is being mined from four domes, brine is being produced from four, and gypsum is being quarried on one dome.

The average depth to which the deepest well was drilled on each dome is 6,820 ft. An extensive table included in the paper gives particulars regarding each dome; locations are shown on a map.

Permeability Measurements.—Harry M. Ryder, in OIL & GAS JOUR., vol. 34 (1936), No. 50, pp. 28–33.

In the planning and development of a repressuring operation, whether it is proposed to use air, gas, or water, or in the search of repressurable sands, the most important physical measurement of the sand properties is the permeability. Porosity and saturation are indeed vitally important in determining whether or not a sand is worth re-pressuring, but they have little to do with how to repressure it.

Until a few years ago practical permeability measurements on oil sands was not possible. The first methods devised for the purpose had serious limitations. They required the use of a core. It is a fact that for many other purposes coring is indispensable, but it is impracticable, in the day-to-day development of territory of known general characteristics, to carry out coring operations on the necessary scale. In strata where conditions are not uniform, a permeability test on a single specimen may not be representative and consequently may lead to entirely erroneous conclusions; in actual practice permeability has been found to vary enormously in the space of a few inches vertically and from well to well at the same elevation.

The problem, therefore, is to find a method which will enable average permeability measurements to be made in a practical manner, and with a minimum of time and expense. Where coring is impractical the only material remaining on which to work is the drill cuttings. The procedure chosen by the author is as follows: A sample of cuttings from the boiler is thoroughly washed and dried without scorching. The portion that remains on a 30-mesh sieve is examined, and 100 clumps or clusters (rejecting mica, shale, etc.) are selected; these clusters are lightly heated to almost a red heat to burn out any oil, and are lightly crushed in a mortar, avoiding any grinding effects. The crushed material is then sifted through a stack of sieves—30, 40, 60, 80, 140, 325 mesh. The permeability of the sand represented by the sample is then calculated by the following formula

$$\text{Millidarcies} = 100 \left(\frac{L}{L + \frac{S}{4} + 4B} \right)^4$$

Where L = Total weight of all sand on 140-mesh sieve and larger mesh sieves.
S = Weight of sand on 325-mesh sieve.
B = Weight of sand on bottom.

This formula has been developed from observations on sand found in the northern part of the Bradford field in Pennsylvania and does not necessarily apply to other fields. A wide similarity has been found between the permeabilities determined on cores and the results obtained by the new method. The time required for a single permeability determination is approximately one hour, which means about three days for making a permeability profile for wells of 100 ft. total sand thickness, which by comparison appears well worth while. The explosive saved in what would be unnecessary shooting of unproductive sand often pays for the analysis.

World Oil Production—Official Figures for 1935 and 1936 Revised

All figures furnished direct to WORLD PETROLEUM by Governments, except where otherwise specified

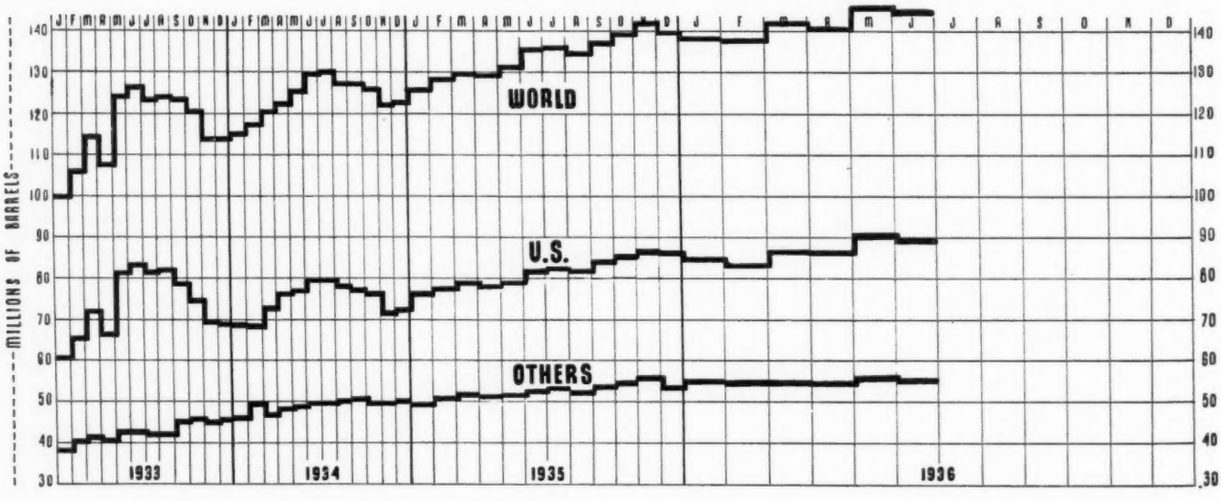
(Figures in U. S. Barrels—Conversion ratio 7 bbl. = 1 ton)

Country	July 1935	August 1935	September 1935	October 1935	November 1935	December 1935	January 1936	February 1936	March 1936	April 1936	May 1936	Provisional Figures June 1936
United States	85,485,000	84,816,000	84,109,000	88,160,000	86,475,000	88,711,000	88,820,000	82,120,000	90,568,000	90,479,000	93,739,000	89,550,000
Russia	14,777,000	15,091,300	14,849,100	16,040,500	16,050,000	16,100,000	16,353,400	15,278,200	16,340,800	15,100,000[1]	15,550,000[1]	15,150,000
Venezuela	13,429,885	12,628,067	13,151,362	13,681,619	13,152,776	13,389,789	13,487,089	12,849,480	13,432,671	13,442,870	13,722,933	12,486,600
Roumania	5,075,000	5,030,000	4,932,000	5,181,000	5,215,000	5,361,000	5,242,000	4,809,000	5,209,000	5,226,000	5,568,000	5,563,000
Iran[2]	4,249,000	4,634,000	4,270,000	4,109,000	4,522,000	4,816,000	4,627,000	4,480,000	4,641,000	4,312,000	5,376,000	4,488,840
Netherland India	3,531,857	3,699,430	3,661,259	3,767,596	3,528,889	3,612,056	3,614,436	3,407,194	3,670,877	3,532,375	3,721,613	3,549,417
Mexico	3,573,632	3,570,908	3,442,259	3,461,457	3,340,713	3,666,265	3,377,302	3,285,965	3,542,088	2,997,883	3,235,255	3,167,380
Iraq	2,445,625	2,166,794	1,962,541	2,374,393	2,309,867	2,240,819	2,327,332	2,107,210	2,515,345	2,048,053	2,467,136	2,473,660
Colombia[4]	1,639,054	1,576,307	1,555,676	1,623,372	1,582,952	1,004,474	1,611,618	1,475,403	1,619,620	1,427,193	1,598,544	1,529,901
Peru[5]	1,448,225	1,442,565	1,448,133	1,493,236	1,343,848	1,381,031	1,377,006	1,293,627	1,351,810	1,403,626	1,500,485	1,452,306
Argentina	1,198,550	1,198,537	1,152,919	1,200,698	1,193,434	1,304,554	1,310,129	1,273,243	1,366,691	1,260,277	1,264,273[1]	1,257,390
Trinidad	988,341	1,003,382	992,445	1,015,492	1,078,957	1,086,530	1,079,082	983,424	1,081,191	1,026,423	1,066,728	1,078,186
British India	791,774	796,150	775,133	790,612	649,041	841,764	854,644	756,384	791,162	735,660[1]	784,300[1]	774,120
Poland	308,000	315,000	301,000	308,000	294,000	308,000	338,800	323,400	338,800	323,400	331,100	323,400
Brunei	283,430	281,400	256,480	233,310	242,900	274,540	253,400	237,930	257,250	270,900	225,890	206,780
Germany	276,990[3]	241,801[3]	229,712[3]	232,659	236,789	263,879	254,492	227,444	274,393	246,519	244,552	246,210
Japan	146,863	152,290	144,312	158,165	145,749	147,827	183,651	165,877	196,569	194,167	203,071	198,750
Sarawak	151,830	154,000	145,600	148,400	141,400	140,700	139,300	127,050	136,290	130,900	134,610	128,660
Ecuador	144,812	135,549	138,986	147,449	143,518	146,541	148,980	138,721	162,125	159,666	163,855	156,703
Canada	118,812	117,652	123,919	122,525	116,756	125,658	121,231	107,928	117,824	107,748	107,748	112,950
Egypt	103,488	104,937	100,954	103,341	96,495	94,969	91,497	97,573	111,846	101,038	107,989	106,694
France[1]	45,276	46,312	43,530	44,981	43,530	44,981	44,981	42,079	44,981	43,530	44,981	43,530
Bahrein[1]	105,400	105,400	105,400	105,400	105,400	105,400	300,000	300,000	300,000	300,000	300,000	300,000
Others[1]	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
Total	140,392,844	139,373,781	137,966,720	144,578,205	142,084,014	145,242,777	146,032,370	135,962,132	148,145,333	144,944,228	154,533,063	144,419,477

[1] Estimate. [2] Anglo-Iranian Oil Co. figures revised; fuel oil returned to the ground has been deducted. [3] Thuringia estimated 7,000 bbl.; official figure for Prussia. [4] International Petroleum Company's figures. [5] International Petroleum Company and Lobitos Oilfields Ltd. figures.
Russian Sakhalin included with Russia. Japanese Sakhalin included with Japan.

Official Crude Oil Production Figures for 1932 to 1936

	Total 1936	Daily Average 1936	Total 1935	Daily Average 1935	Total 1934	Daily Average 1934	Total 1933	Daily Average 1933	Total 1932	Daily Average 1932
United States	535,276,000	2,941,077	993,942,000	2,723,129	909,107,000	2,490,704	898,874,000	2,462,670	785,159,000	2,145,243
Russia	93,772,400	515,233	176,688,100	469,608	168,648,700	462,051	149,901,900	407,950	149,719,000	409,070
Venezuela	79,421,643	436,383	153,932,611	421,733	140,784,805	385,712	120,882,802	331,186	119,596,512	326,766
Roumania	31,617,000	173,720	61,150,000	167,534	62,006,000	169,879	50,971,200	139,647	50,491,205	137,954
Iran	27,924,840	153,433	52,413,879	143,600	52,663,782	144,284	49,581,280	135,840	45,122,455	123,285
Netherland India	21,495,912	118,109	42,569,625	116,629	42,289,408	115,861	38,512,663	105,516	39,584,027	108,153
Mexico	19,605,873	107,725	40,234,902	110,233	38,167,022	104,567	33,904,882	92,890	32,802,285	89,624
Iraq	13,938,736	76,586	24,850,924	68,085	7,935,657	21,742	1,200,000	3,288	1,200,000	3,300
Colombia	9,262,279	50,892	17,617,654	49,740	17,340,724	47,509	13,157,127	36,047	16,384,956	44,768
Peru	8,378,860	46,038	16,835,206	46,270	15,936,937	43,663	13,923,281	38,146	9,899,266	26,026
Argentina	7,732,003	42,484	14,317,500	39,226	14,045,652	39,015	13,759,565	38,232	13,166,900	35,975
Trinidad	6,315,034	34,698	11,669,792	31,686	10,894,363	29,847	9,560,039	26,192	10,023,780	27,387
British India	4,696,270	25,804	9,227,496	25,281	8,997,399	24,650	8,721,655	23,893	8,600,312	23,500
Poland	1,978,900	10,873	3,973,200	10,885	3,697,617	10,130	3,858,085	10,570	3,905,230	10,670
Brunei	1,452,150	7,979	3,162,614	8,647	2,673,041	7,323				
Germany	1,493,610	8,207	3,054,023	8,409	2,266,964	6,211	1,712,823	4,692	1,824,019	4,983
Japan	1,142,085	6,275	1,848,656	5,065	1,484,962	4,068	1,377,761	3,827	1,575,333	4,375
Sarawak	796,810	4,378	1,811,297	5,002	1,948,044	5,337	2,289,472	6,273	2,274,043	6,213
Ecuador	930,050	5,110	1,725,354	4,727	1,655,062	4,534	1,622,624	4,446	1,573,857	4,300
Canada	675,429	3,711	1,434,467	3,930	1,418,810	3,887	1,147,825	3,144	1,054,373	2,880
Egypt	616,637	3,388	1,215,606	3,356	1,479,037	4,052	1,591,495	4,360	1,742,370	4,760
France	264,082	1,451	529,664	1,451	552,000	1,512	552,000	1,515	552,000	1,508
Bahrein	1,800,000	9,895	1,264,809	3,465	285,071	781				
Others	450,000	2,473	900,000	2,470	861,000	2,359	432,000	1,184	432,000	1,180
	871,036,603	4,785,922	1,636,369,379	4,470,161	1,507,139,057	4,129,678	1,417,534,479	3,884,022	1,296,682,923	3,544,940



World crude oil production by months, 1933–1936. Chart is weighted to compensate for variation in number of days per month. Ratio in U. S. crude production to world production.

UNITED STATES

	Daily Crude Oil Production bbl.	Daily Runs to Stills bbl.	Total Motor Fuel Stocks bbl.	Imports for week bbl.	California Shipments East for week bbl.
Week ending June 27	2,969,000 445,000[1]	2,930,000	68,441,000	1,297,000[2]	none
Week ending July 4	2,892,000 429,500[1]	2,855,000	67,040,000	1,165,000[2]	72,000
Week ending July 11	2,949,500 431,500[1]	2,870,000	66,646,000	1,102,000[2]	211,000
Week ending July 18	2,981,500 432,000[1]	2,925,000	66,134,000	863,000[2]	333,000

Underlined figures indicate improvement in statistical position—decrease in production, runs to stills, gasoline stocks and imports.

[1] Estimated total production of the East Texas field.

[2] Import figures include all oil imported, for domestic use and in bond for re-export, it being impossible to make the separation in weekly statistics.

General Situation

JULY state elections in Texas and Oklahoma, as well as the forthcoming November national elections, have temporarily postponed all new state and federal legislative measures proposed at various times to stabilize further the oil industry. Meanwhile, production and runs to stills have continued at a level considerably in excess of the recommendations of the Bureau of Mines, and very much above the state allowables, which were set below the Bureau of Mines recommendations in order to effect appreciable reductions in the excessive stocks of motor fuel. The present indications point definitely towards a continued high rate of production through August and September, with crude oil runs to stills at about the present rate of 2,950,000 bbl. per day, in which case the industry will enter the winter with total gasoline stocks some 7,000,000 bbl. to 8,000,000 bbl. in excess of total stocks of gasoline in November of 1935. If, as is probable, production and crude runs to stills are not radically curtailed by October, a break in gasoline and crude oil prices of major proportions appears inevitable. In past years the oil industry has effected major reductions only under threats of the federal government to regulate the business and it appears at this time that the only restraining influence will be the desire of major companies and of independents to avoid again such outside interference. During the coming winter, however, self-regulation of the industry will be much more difficult than in the preceding years because of the unprecedented drilling developments and hundreds of successful completions in Southwestern Texas, East Texas, Gulf Coast, New Mexico and Western Kansas. To be at all successful in the coming months and years, state regulations setting allowables will have to invoke the acreage factor since the present well allowable system has been responsible for hundreds and thousands of unnecessary wells which have greatly complicated the tasks of the state regulatory bodies. In all probability, late 1936 or early 1937 will see the acreage factor approved by the various state legislatures.

The fundamental weakness of the oil industry is particularly distressing in view of the record-breaking demand for motor fuel, which has averaged 9.43 percent above 1935 during the first 5 months of the year. In other words, just a relatively small measure of effective proration would have placed the oil industry during the present summer months in a most excellent statistical and price position, and in a much better condition to weather the next winter season. The improvement in the demand for motor fuel was paralleled by a general advance in business activity in the United States to the best levels since early 1930. The New York Times weekly business index advanced to 102.2 in the week ending July 4, 1936, as compared with 83 in July of 1935, 86 in July of 1934, 88 in July of 1933 and 68 in July of 1932, the lowest point of depression. In July of 1929 the index stood at 113. The drought, while of major proportions and of great influence locally, did not affect either the country's business as a whole or the total record-breaking motor fuel consumption.

Price Trend Slow

AS INDICATED above the current price structure for motor fuel was barely maintained, though at this time of the year strong prices should have prevailed. Definite relative weakness was shown in the Group 3 refinery gasoline market, while retail prices were cut at several points in the east about one cent per gallon. Kerosene quotations also declined about 3/8 of a cent per gallon, but natural gasolines moved up for fall and winter accumulations and blending.

Tank wagon/service station motor fuel prices per gallon, regular grade, including all taxes, in representative districts at the end of July were: 13.2/18.2 cents in metropolitan New York (off 1.0/1.0 cents per gallon); 13.0/16.5 cents in Newark, N. J. (off 1.0/1.0 cents per gallon); 13.0/16.5 cents in Boston, Mass. (off 0.5/0.5 cents per gallon); 12.0/15.5 cents in Providence, R. I.; 15.5/17.5 cents in Chicago; 17.5/19.5 cents in Ohio; 17.0/18.0 cents in San Francisco; 16.5/17.5 cents in Los Angeles; 17.0/19.0 cents in Oklahoma; 15.0/17.0 cents in Dallas and Fort Worth (off 1.0/1.0 cents per gallon) and 16.0/18.0 cents in Houston, Texas; with third grade gasoline in East Texas area again selling off at 12 to 13 cents per gallon at independent service stations; 15.7/17.7 cents in St. Louis; and 19.5/22.0 cents in Montreal, Canada; all with a 2-cent differential for the premium grade.

Refinery gasoline quotations continued unchanged from the preceding month but prices exhibited definite sluggishness during July. Refinery gasoline was quoted on July 20 at 4¾–4⅞ cents per gallon for 58–60 U.S.M. grade, 62.9 and below octane rating in Group 3, Oklahoma market; 63.0–67.9 octane rating, U.S.M., regular grade, was quoted at 5⅜–5⅝ cents per gallon; and 68 and above octane rating, U.S.M., was quoted at 6–6⅛ cents per gallon. East Texas refinery market continued firm and unchanged from the preceding month and at the end of July third grade gasoline eligible for interstate tenders was quoted at 4⅝–4⅞ cents per gallon, with a ⅛ to ¼-cent discount for the same product available for only intrastate commerce. On the east coast at Bayonne, U.S.M. grade, 60.0–64.9 octane rating gasoline continued unchanged during the last month at 6½ cents per gallon (3.84 cents gold*). Gulf Coast prices for export advanced about ¼ cent per gallon to 5¼ cents for grade 58–60 U.S.M. (3.10 cents gold*) by July 20, due partially to more active markets.

Natural gasolines advanced during the past month about ½ cent per gallon with the appearance of the seasonal demand by the refineries in preparation for the fall and winter motor fuels. On July 20 grade 26–70 was quoted at 3.00 cents per gallon (1.77 cents gold*) in Oklahoma; at 2¾ cents per gallon (1.62 cents gold*) in North Texas; and at 2⅞–3 cents per gallon (1.73 cents gold*) in North Louisiana.

Kerosene prices were directly affected by the drought and the resulting decline in demand for tractor fuel, dropping about ⅜ of a cent during the last month. On July 20 grade 41–43 w.w. was quoted at 3⅜–3⅝ cents per gallon in Group 3, Oklahoma market, and at 4⅝–4¾ cents per gallon (2.75 cents gold*) on the east coast at Bayonne. Gulf Coast prices for export were particularly weak, declining by July 20 to 3 cents per gallon (1.77 cents gold*) for 41–43 p.w. grade, and to 3⅛ cents per gallon (1.84 cents gold*) for 41–43 w.w. grade. On July 20 No. 1 p.w., 38–42 grade furnace oil was quoted at 3⅛–3¼ cents per gallon, off ⅜ of a cent per gallon under the preceding month; and U.G.I. grade gas oil was quoted at 2½–2¾ cents per gallon, unchanged from the preceding month, all in Group 3, Oklahoma market.

* U. S. dollar at 41 percent discount.

Imports and Exports

DURING May of 1936 total gross imports of crude petroleum and all its products into the United States amounted to 5,245,000 bbl. (169,000 bbl. per day), as compared with 4,870,000 bbl. (162,200 bbl. per day) imported during April; out of this total during May 3,277,000 bbl. (106,000 bbl. per day) were imported for domestic use and 1,968,000 bbl. (63,000 bbl. per day) were imported in transit, either for refining and re-export or for use in vessels in foreign trade. During the preceding month, April, 3,106,000 bbl. (103,600 bbl. per day) were imported for domestic use and 1,764,000 bbl. (58,800 bbl. per day) were imported in bond as indicated above. During May, 1936, the net imports for domestic use of 106,000 bbl. per day were 2.21 percent under the former federal allowable of 108,400 bbl. which was effective under N.R.A.

Exports of crude petroleum and all its products during May of 1936 reached 12,226,000 bbl. (394,000 bbl. per day), as compared with 10,025,000 bbl. (334,000 bbl. per day) exported in April, 1936, an increase of 17.96 percent in the daily rate. The May, 1936, exports were 25.5 percent above the shipments in May of 1935, when 9,739,000 bbl. (314,000 bbl. per day) were shipped. Exports of crude oil from the United States during May of 1936 amounted to 4,390,000 bbl. (141,500 bbl. per day), as compared with 3,743,000 bbl. (124,800 bbl. per day) shipped in April of 1936, an increase of 13.4 percent; in May of 1935 4,613,000 bbl. (149,000 bbl. per day) of crude oil was exported. In May of 1936 crude oil exports constituted 35.9 percent of the total exports of all petroleum products.

Crude Production and Runs to Stills

CRUDE oil and natural gasoline production during June of 1936 continued in an excessive and uneconomic volume of about 3,120,000 bbl. per day, 17,000 bbl. per day under the May average, thus continuing to exert a depressing influence on the crude oil and refinery gasoline price structure. The June, 1936, crude oil and natural gasoline production was 275,000 bbl. per day above the production in June of 1935, an increase of 9.66 percent. The largest proportion of overproduction above the Bureau of Mines recommendations was again derived from Louisiana, which exceeded its quota by 1,398,000 bbl., or 26.50 percent; California overproduced 1,274,000 bbl., or 7.92 percent; while Texas exceeded its quota by 976,000 bbl., or 2.89 percent. Oklahoma underproduced 90,000 bbl. during June and Kansas underproduced 219,000 bbl. under the federal quotas. During the first three weeks of July, California and Louisiana continued to produce in excess of recommendations of the Bureau of Mines, while Texas, Oklahoma and Kansas kept within federal quotas, but considerably in excess of the allowables set by the state regulatory agencies.

Crude oil runs to stills during June, 1936, averaged about 2,945,000 bbl. per day, 21,000 bbl. per day under the runs to stills during the preceding month, May of 1936, when 2,924,000 bbl. were processed per day. Crude oil runs to stills in June of 1935 averaged 2,724,100 bbl. per day, thus indicating that during June of 1936 crude oil runs were 200,100 bbl. per day above the runs in the corresponding month of 1935, an increase of 7.34 percent. Total stocks of all petroleum products increased 3,304,000 bbl. during May of 1936 to a total of 554,423,000 bbl., indicating a daily gross addition to stocks of 106,600 bbl.

Motor Fuel Demand

INDICATED domestic demand for motor fuel during May of 1936 averaged 1,355,000 bbl. per day, 4.72 percent above the average during the preceding month when 1,294,000 bbl. were consumed per day. The domestic demand during May of 1936 was 85,200 bbl. per day above the domestic motor fuel consumption in May of 1935, an increase of 6.72 percent; it was also 114,300 bbl. per day above the domestic motor fuel consumption in May of 1934, an increase of 9.20 percent. During May of 1936, 87,000 bbl. of motor fuel per day were shipped from the United States, 3.57 percent above the daily motor fuel exports of the preceding month; 25.9 percent above the motor fuel shipments in May of 1935; and 41.45 percent above the motor fuel exports in May of 1934. For the first five months of 1936 the total demand for motor fuel amounted to 187,420,000 bbl., or 9.43 percent above the demand in the corresponding period of 1935.

On June 1, 1936, motor fuel stocks at refineries, plants, terminals and in transit, inclusive of natural gasoline, amounted to 77,269,000 bbl., indicating a withdrawal from storage of 1,298,000 bbl. during May, a daily average withdrawal of 41,800 bbl.

BASIL B. ZAVOICO

Gulf Export Prices for Major Oil Products

Products		Cents per Gallon			
		June 24	July 1	July 8	July 15
Gasoline:	U. S. Motor	5¼	5⅛	5¼	5¼
	64/66–375 E.P.	5½	5½	5½	5½
	59 Octane & below	5½	5½	5½	5½
	65 Octane & above	6⅛	6⅛	6⅛	6⅛
Aviation Gasoline: 73 Octane & above (Tank-car F.O.B. Ref.)		10	10	10	10
Kerosene:	44 w.w.	4⅛	4⅛	4⅛	4⅛
	41–43 w.w.	3⅝	3⅝	3⅝	3⅝
	41–43 p.w.	3¾	3⅝	3⅝	3¾
Gas oil:	26–30 translucent	3¼	3⅛	3⅛	3⅛
	30 plus translucent	3¼	3⅛	3⅛	3⅛
Fuel oil:	Grade C Bunker (per bbl.)	.90	.90	.90	.90
	Cargo lots (per bbl.)	.84	.84	.83	.83
	Diesel oil (per bbl.)	$1.50	$1.50	$1.50	$1.50
Lubricating Oil: (New York Export Market)	Bright Stock No. 8	28	28	28	28
	Bright Stock No. 6½	27½	27½	27½	27½
	Warren E.	22½	22½	22½	22½
	600 Unfiltered	20½	20½	20½	20½
	650 Unfiltered	21½	21½	21½	21½
	600 Flash s.r.	22½	22½	22½	22½
	650 Flash s.r.	24½	24½	24½	24½
	Neutral 200 No. 3	27½	27½	27½	27½
	Neutral 150 No. 3½	24	24	24	24
So. Texas:	Red oil 500 No. 5–6	7¼	7¼	7¼	7¼
	750	9	9	9	9
	1200	9¼	9¼	9¼	9¼
	Pale oil 500	7⅞	7⅞	7⅞	7⅞
	750	9	9	9	9
	1200	9¼	9¼	9¼	9¼
Crude Oil:	East Texas crude delivered at Gulf port for Export (per bbl.)	$1.35	$1.35	$1.35	$1.35
	Venezuela (per bbl.)	.83	.83	.83	.83
	Trinidad crude (per bbl.)	.85	.85	.85	.85
	Panuco crude (per bbl.)	.73	.75	.85	.95

Freight Rates

	June 24		July 1		July 8		July 15	
	Dirty	Clean	Dirty	Clean	Dirty	Clean	Dirty	Clean
(Shillings per ton)								
Calif.—U. K. or Continent	20/6	21/6	20/6	21/6	20/6	21/6	20/6	21/–
Gulf—U. K. or Continent	14/7	15/–	14/7	15/–	14/7½	14/7	14/7½	14/7
(Cents per barrel)								
Calif.—North Atlantic	55	55	55	55	55	55	55	55
Gulf—North Atlantic	17	16½	17	17	17	18	17	18
Venezuela—North Atlantic	20	—	20	—	20	—	20	—
Tampico—North Atlantic	20	—	20	—	20	—	20	—

CANADA

ONLY copper and petroleum showed decreases in the mineral production figures issued for the first quarter of 1936 by the Bureau of Statistics, Department of Trade and Commerce, Ottawa. Production of petroleum during the first quarter was 346,983 bbl. as compared with 356,763 bbl. during the same period of 1935.

Imports of petroleum into Canada during April, 1936, were 54,142,896 gallons, valued at $1,807,500 as compared with 40,446,492 gallons valued at $1,227,571 in April of last year and 65,383,199 gallons, valued at $2,090,-522 in March of this year.

An announcement from Vancouver, B. C., states that the Home Oil Company plans considerable expansion. Although originally formed to produce oil in the Turner Valley of Alberta, and distribute it in Pacific coast centers, the company has branched into several other fields and now has extensive holdings in mine properties.

In addition to holdings in Pacific Eastern, where promising results have been reported recently, Home Oil has a large stake in Placer Engineers. With a view to using its drilling equipment for test wells in cooperation with other firms, the company is now planning to investigate several new fields in Alberta.

At the annual meeting, Colonel Nelson Spencer, president, reported that a majority interest in Home Oil is now held outside the province of British Columbia. He expressed the hope that this condition might soon be altered so as to return control to interests within the province.

The Goose River Oil Refinery Company has its refinery just outside of Kindersley, Saskatchewan, well under way, according to a report of June 22nd.

Dr. John L. Binder is now at Kindersley to supervise the installation of the refinery of which he will be production manager. W. Forrest Halpenny, of Madison, and Robert Arnold, of Darcy, are president and vice president, respectively, of the company. W. H. Flood is the managing director. It is expected that the plant will be in production in time to supply harvest needs.

BARRING accidents, it is confidently expected by officials that oil will have been struck within a few weeks following June 20th, when they saw their first well spudded in on the property of the Roxana Oil Company, nine miles south of Morley and forty-four miles west of Calgary.

The Roxana derrick stands in a small clearing surrounded by forest land untouched by axe or fire. On the north and south sides precipitous slopes rise 750 ft. approximately half a mile apart. The Rockies stand guard at the western end of the valley in which the derrick is located and to the eastward the valley runs out for 25 miles into the foothills. Four miles of road, up a rising, winding creek bed, now dry, had to be constructed by the company, to bring in 215 tons of equipment to the site chosen for the test well.

Financed by Seattle and Dutch capital, the well claims to have a drilling advantage over Turner Valley of 5,700 ft. structurally. It starts in the Kootenay formation, according to geological evidence revealed on the adjacent canyon walls, at the top of which lies exposed the Blairmore strata. Officials hope that the limestone will be reached at 600 ft. instead of at the 6,000 ft. depth required in Turner Valley.

The well will be drilled with standard equipment with drilling operations in charge of A. P. Phillips and Bob Smirl. Production was believed possible in six weeks. Large savings are anticipated in drilling with the prospect of little casing being required due to the hope that the limestone will be reached at 600 ft.

It is believed that the basin is the result of erosion and not of mountainous upheaval and the directors feel that vast stores of oil are retained in the under-strata. If the area should come up to expectations it will mean the opening up of important fields which may extend on to the Indian Reserve, with the consequent enrichment of the Stonies who have shown considerable interest in the operations so far.

On the north side of the gorge, two miles away, the old Wabash well, situated on the Blairmore strata, went down 3,000 ft. for gas showings some years ago. If the Roxana well reaches production, deepening of the wells in the Wabash area is predicted.

R. A. Brown, president of Turner Valley Royalties crude producer, announced last month that in line with the suggestions received from provincial authorities, their new well will be tubed to conserve gas in the belief that crude production will consequently be increased.

In the opinion of engineers, the well brought into production during the third week of June by Turner Valley Royalties may be the first puncture into the mother pool of crude oil long sought throughout the province of Alberta. Hon. C. C. Ross, Alberta Minister of Mines and Lands, said, "If we could get another ten of those we would be absolutely independent of crude from Montana." He added that the well at about 6,840 ft. is running between 900 and 1,000 bbl. of crude oil and about 2,000,000 cubic ft. of gas daily. The oil has a paraffin base with a Beaume gravity between 43 and 45.

R. C. ROWE

MEXICO

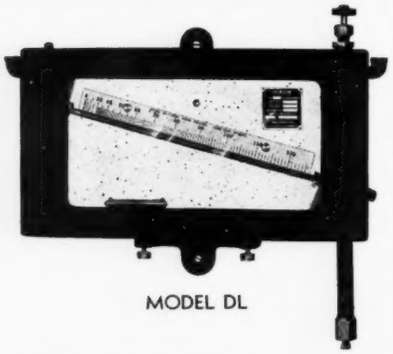
THE short-lived general strike appears to have had some effect in cleaning up the labor situation, temporarily at least. At any rate it is now announced that the long standing strike of workers of the Huasteca Petroleum Co. has been settled. Some of the workers returned to their jobs on July 30 and the remainder were expected to be back on duty at the beginning of the first week in August. The strike had been under way since early in the year. Negotiations for ending it had been under way for months and several weeks ago it was announced that the points in dispute had been reduced to three.

Early settlement of the strike was forecast recently when the national supreme court set aside a ruling of the federal board of conciliation and arbitration requiring the company to employ 122 strikers to guard and keep in running order the plant of its El Ebano unit in San Luis Potosi. The court upheld the contention of the Huasteca officials that 23 watchmen and mechanics were sufficient for the purpose. In making its decision the court observed that to require employment of a large number of men for such a purpose would tend to prolong strikes indefinitely, whereas it was to the advantage of the state and society to have them settled as promptly as possible.

The strike against the Mexican Eagle Oil Co. which involved several thousand employees of the production units of the company on the Isthmus of Tehuantepec in southern Vera Cruz is still on but it is believed that the adjustment of Huasteca's differences with its workers may lead to its termination very soon. The strike was called only a fortnight ago and has not interfered with the company's refining operations.

DOUGLAS GRAHAME

MERIAM
INCLINED TUBE
FLOW METER



MODEL DL

THIS inclined tube flow meter can be built for any range in the lower differential bracket. It can be furnished for the flow measurement of any fluid, air, gas, steam, water, etc., and is designed to operate on line pressures up to 150 lbs.

The body of the instrument is of cast semi-steel. The tube is heavy wall Pyrex glass, gland-packed and replaceable in the field. The drop leg provided serves as a return well, preventing surges in the line from blowing the indicating liquid out of the meter.

The zero adjustment assembly at top of instrument provides, by use of a plunger, a very convenient means for setting the indicating liquid accurately to zero. The mounting bracket shown is a part of the instrument and incorporates an easy level adjustment.

Complete descriptions and specifications sent upon request.

The Meriam line includes Manometers, Flow Meters (Vertical and Inclined Tube), Draft Gauges, Gauge Pulsation Absorbers, Orifice Plates and Pipe Flanges. Special instruments also designed and built to order.

The MERIAM Co.
Meriam-Made Precision Instruments for the Petroleum Industry
CLEVELAND, OHIO

Representatives:
Crawford Eng. Co., New York; Maleson Co., Philadelphia
S. D. Shook & Co., Pittsburgh; Mayer & Oswald, Inc., Chicago
Carl F. Gast, St. Louis; H. R. Bowen, Cleveland

SHIPPING

ACCORDING to a report from Paris the Anglo-Iranian Oil Company, Ltd., is ordering six tankers of 12,500 tons d.w. each. The total value of this order amounts to £1,000,000 and brings Anglo-Iranian's total construction for this year to 18 tankers at a total cost of £300,000,000.

A rumor is rife, although nothing has yet been confirmed, that the Royal Dutch-Shell group is on the eve of another large constructional programme. Enquiries made at the time of writing this article have elicited no definite statement on the matter but a hint that further orders were likely to be placed was given recently on the trials of the motorship ARINIA, built at Port Glasgow for the Anglo-Saxon Eagle Oil and British Tanker Companies. She is the third of a group of 16 vessels built or building for the syndicate and is a 12,180 tonner with service speed of about 12 knots. An important official of the company, speaking during the trials, stated that before very long he hoped that as a result of increased sales for their products more vessels would be ordered from the Clyde.

It is important from a British point of view to remark that during the last 18 months the Shell Company has placed contracts for about 16 new tankers with an aggregate of 186,000 tons, about 4,000 tons of British steel being required for the building of each ship. Assuming 3½ tons of coal go into a ton of steel, about 750,000 tons of coal are absorbed in the construction of the group. During the construction of the 16 new vessels, a total of about 16,000 men will be employed. One of the factors which leads to the supposition that new tonnage orders are imminent is the completion this year of a number of outstanding time charters for the Royal Dutch-Shell Company.

In Scandinavia there is still considerable activity in tramp tanker construction and prominent builders in Sweden are of the opinion that they could take many more orders from Norwegians, if they felt justified in doing so. There is a policy of caution which is now being instituted in this country.

It is not yet known whether any increase in speed or any special technical improvements will be made in new Anglo-Saxon programmes. Certainly a slight increase in speed would make it very embarrassing for owners of charter tankers, but such increase would be equally awkward for existing ships in the fleet. It is not likely, therefore, that Japanese activities on the speed question will in any way be simulated in the near future.

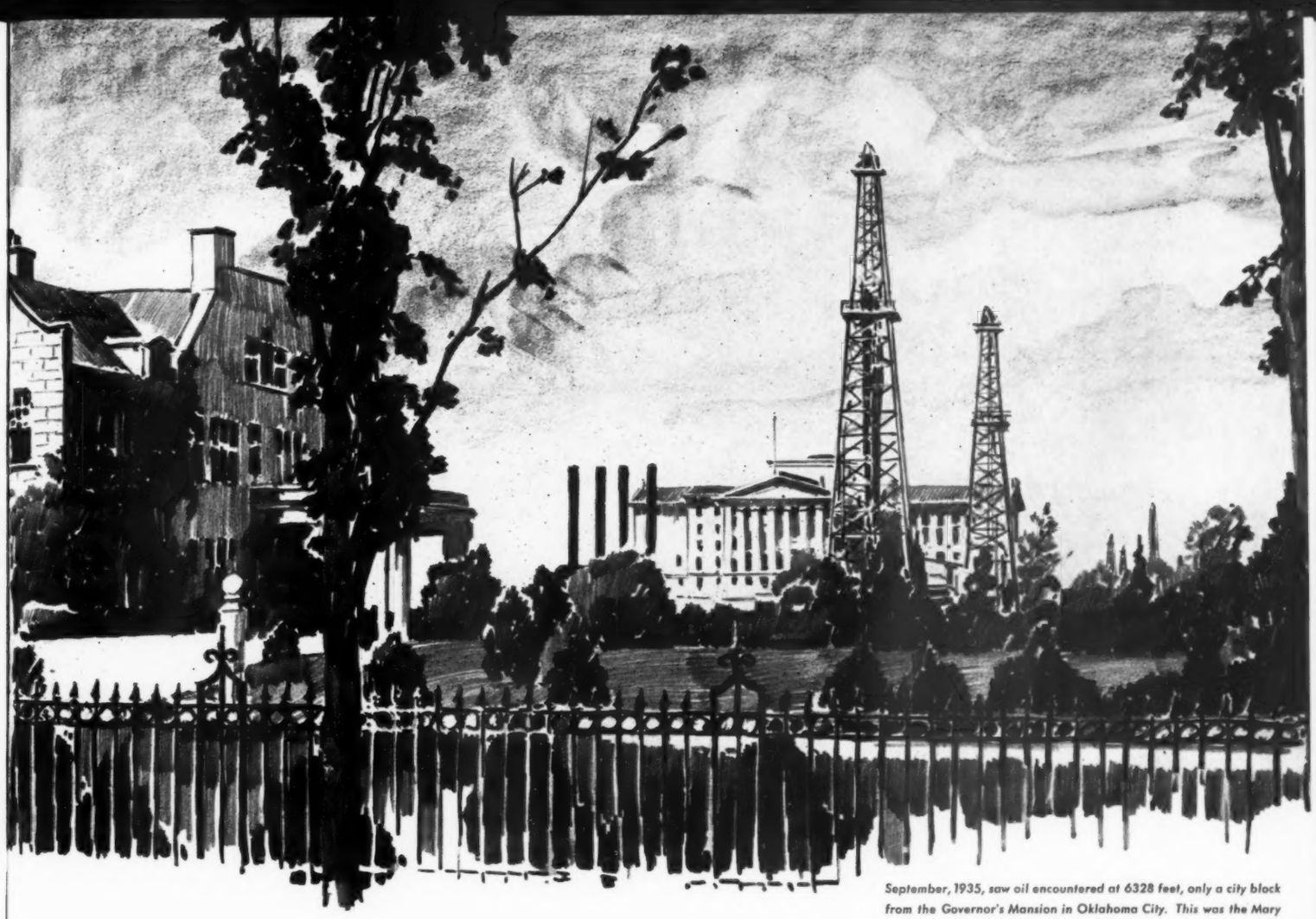
One interesting feature about tanker building in Scandinavia at the moment is the increasing use which is being made of welding. One ship in Sweden of large ocean-going dimensions will be welded practically throughout, with the exception of certain portions of the shell. This applies also to a ship constructed in Denmark for one of the Standard groups. The smaller size coastwise vessels are being welded practically throughout. Two interesting coastwise ships are worth mentioning in this connection. One has dimensions 75 x 18 x 7 ft. and employed 21,000 electrodes. The plate thickness of shell plating deck and bottom is 8 mm., the joints being overlapped and construction being on the Truss Weld system. This vessel was completed last year and has 128 h.p. Diesel for propulsion. She loads 110 tons. A larger sister ship completed this year loads 125 tons, has the same thickness of plate and employed 28,500 electrodes. This ship was built on the Truss Weld system for tanks, the other parts being transversely frame. She has dimensions 82 ft. x 18 ft. 8 in. x 7 ft. 6 in. The well known Swedish O.K. electrodes were employed throughout. These little vessels have machinery and accommodations aft, ice breaker bows and well built up forecastles, one of the ships having also a powerful searchlight. With the exception of their stems, they are similar to some of the coastwise vessels constructed recently in this country for the National Benzole Company.

Lloyd's Register latest returns indicate a revival in steam construction for certain types of vessels. The returns for the June quarter show, however, that motor vessels are in great preponderance—69 vessels of 567,206 gross tons compared with only 10 steamers of 89,420 tons. These latter are made up of one 18,000 tonner in Germany and eight with 67,140 gross tons in America. The largest individual builder of motor tankers is Great Britain with a total of 22 motor tankers of 175,700 tons gross, Germany coming next with 15 tankers of 123,380 tons building, many of which are due to the Unilever group spending their frozen monies. Holland comes next with eight ships of 57,540 tons. Denmark is constructing only four tankers with 37,570 gross tons, a number similar to those building in Japan where the gross tonnage is 34,865 tons. Sweden is building eight tankers of 73,800 tons, Italy only one of 6,125 tons and France one of 15,456 tons.

A. C. HARDY

▼

IT IS reported that drilling licenses have been awarded to the Anglo-American Oil Company, Ltd., covering 478 sq. miles in Sussex and Hampshire.



September, 1935, saw oil encountered at 6328 feet, only a city block from the Governor's Mansion in Oklahoma City. This was the Mary Green Number One which was followed by a drilling boom that gave Oklahoma City the Mansion Pool within its own corporate limits. Above is the Mansion of the Governor of Oklahoma and Oklahoma's State Capitol, showing oil wells on state property

The Mansion Pool in the corporate limits of Oklahoma City characterizes the vigorous enterprise of the oil industry in its quest for greater production. This same enterprise has led oil producers to take full advantage of Dowell *Inhibited* Acid treatments. Today the importance of Dowell and its broad service is an accepted fact.

DOWELL

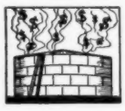
DOWELL INCORPORATED • *Subsidiary of* THE DOW CHEMICAL COMPANY • *Executive Office:* MIDLAND, MICHIGAN • *General Office:* KENNEDY BUILDING, TULSA, OKLAHOMA

HOBBS, NEW MEXICO — *PHONE, WRITE OR CALL AT ANY OF THE FOLLOWING OFFICES:* — WICHITA FALLS, TEXAS

MIDLAND, MICHIGAN • MIDLAND, TEXAS • SEMINOLE, OKLAHOMA • SHELBY, MONTANA • SHREVEPORT, LOUISIANA • TULSA, OKLAHOMA • WICHITA, KANSAS

OIL AND GAS WELL CHEMICAL SERVICE

SAVE EVAPORATION LOSS . . .



and

PREVENT FIRE . . .

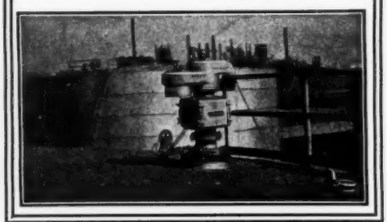
with

OCECO TANK FITTINGS

Used the world over wherever oil is stored

Write for information

JOHNSTON & JENNINGS CO.
891 Addison Road
Cleveland, Ohio, U. S. A.



PROVED IN THE OIL FIELDS OF THE WORLD

AQUAGEL

The Ideal Mud Conditioner

Properly conditioned with a small amount of **AQUAGEL**, native clays will have wall-building properties which prevent caving of holes, stuck drill pipe and casing. Drilling mud prepared with **AQUAGEL** reduces abrasion, prevents cuttings from settling, seals off crevices and insures the landing of casing without sticking.

STABILITE

An Improved Chemical Mud Thinner

STABILITE reduces the viscosities of thick drilling muds without destroying their wall-building properties. **STABILITE**-treated muds quickly release gas from gas-cut muds and are of particular value where weighting materials are used, or in drilling through heaving or caving formations. **STABILITE** assures lower mud-treating costs.

BAROID SALES CO.
LOS ANGELES • TULSA • HOUSTON
NATIONAL PIGMENTS & CHEMICAL CO., ST. LOUIS

U. S. S. R.

Official Figures for Soviet Oil Operations

1936	Crude Production (bbl.)	Daily Average (bbl.)	Runs to Stills (bbl.)	Drilling (feet)
January	16,353,400	527,529	13,993,000	509,950
February	15,278,200	526,731	13,055,000	516,150
March	16,340,800	527,122	13,860,000	566,300
April	15,100,000	503,306	13,600,000	610,000
May	15,550,000	501,670	13,700,000	560,000
June	15,150,000	505,000	13,750,000	565,000
Total 6 months 1936	93,772,400	515,288	81,358,000	3,327,400
Total 6 months 1935	83,780,200	462,322	67,408,600	2,270,704
Total 1935	176,688,100	497,713	146,705,100	4,868,465
Quota 1935	212,310,000	580,082	171,500,000	5,214,000
Quota 1936	213,500,000	584,931	175,000,000	7,100,000

Crude conversion: seven bbl. = one ton.

THE statistical records of the Soviet oil industry for the first six months of 1936 show a decided improvement over the operations for the corresponding period of last year. The increases amount to 10,000,000 bbl. for crude production and about 14,000,000 bbl. for runs to stills, while the increase in distance drilled equals 50 percent. However, as compared with the quotas for the first six months of 1936, all three main divisions show arrears—a particularly alarming situation in view of the necessary gradual acceleration of operations necessary in order to bring about an increase of 50 percent in crude production during 1937 over 1936. The tempo of Soviet agricultural and industrial development is growing by leaps and bounds. Failure of the oil industry to live up to plans is forming a gap between demand and supply for internal use, in addition to delaying expected developments in exports.

The usual expansion of operations expected during the second quarter of the year, owing to favorable weather conditions, did not materialize this year. The improvements registered during April and the first half of May were subsequently wiped out during the second half of May when reverses were encountered, while during June all operations were on a level with May. The total crude production for the second quarter (April–June) shows a decrease of 2,000,000 bbl. as compared with the first quarter (Jan.–March).

Of all Soviet oil fields, the Baku group made the best showings, some of the Baku oil fields having fulfilled the half year plan for crude production 20–25 days ahead of schedule. Most Baku fields, however, have operated below quota and the total average production of all Baku fields for June is between 93 and 95 percent of the plan, which is also about the average figure for the first six months of this year. Other Soviet fields attained the following percent of plan operation: Grozni, 85–89 percent; Maikop, 72–81 percent; Emba, 57–68 percent; Bashkiria, 73–87 percent; Middleasia, 71–75 percent; Turcomania, 60–67 percent; and Sakhalin, 95–104 percent.

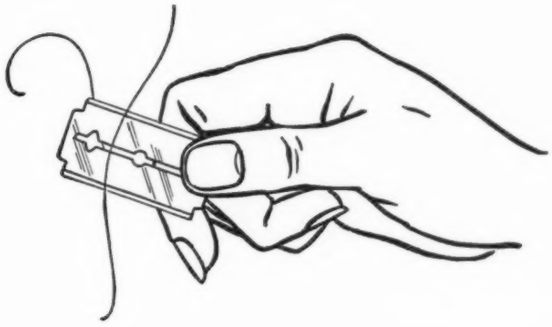
At the end of the half-year period, the year's plan for the production of crude, including natural gas, had been fulfilled 48 percent. Several fields have doubled and tripled their production as compared with last year. Middleasia has increased its output three-fold, Ishimbayevo has doubled its production, while Emba has also showed a considerable increase. All these fields together, however, supply only a small portion of the total crude.

The refining division of the Soviet oil industry is making progress in quantity as well as in quality of operations, due to expanded refining facilities and extension of the cycles of plant operation. Similar improvements have been reported from the drilling division where considerable progress has been made in the form of distance drilled as well as in the speed of drilling per table per month.

Of all the outstanding features of Soviet oil operation most noteworthy are the new prospecting discoveries made during recent months and which are being contoured and extended for commercial operation. At Baku, Grozni, Maikop and other fields new oil lands have been prospected and proved of commercial value and deeper sands opened in old fields. All this is certain, eventually, to increase the total Soviet crude production, although under prevailing conditions considerable time will probably elapse before appreciable returns are evidenced. Past experience has shown that it usually takes two or three years to make these newly discovered oil regions habitable for labor. It must be taken into consideration that such areas usually consist of steppe or desert lands without any means of communication, sparsely populated, and with weather conditions anything but favorable.

Paradoxically, another factor at present hindering anticipated progress is the vast improvement that has taken place in drilling

SPLITTING HAIRS



AXELSON stands for extreme care in the selection of production equipment. Axelson recommends pumps and sucker rods best suited to specific pumping requirements. Axelson has always recognized that no two wells are the same, has long taken the lead in developing equipment to meet conditions. In any sensible policy, however, limits are reached,—points are gained beyond which it does not seem wise to go,—then it comes to "Splitting Hairs."

When it becomes necessary to build sucker rods with such a slight variation in price and life as to have occasional heats of supposedly different rods identical, then we believe it's—"Splitting Hairs."

To Axelson it is more than a matter of constantly mounting inventories. It resolves itself into how much and how many,—will be fooled for how long? Axelson wants no part in this "fool the industry program."

Backed by an experience of forty-four years in the manufacture of pumps and sucker rods, Axelson believes that three grades of good rods all designed for specific pumping conditions are enough.

Questionable differences in products of comparative grades have been carried to a point where claims of some of these products are ridiculed by the public. The time has come where the fancied differences in a multiplicity of Sucker Rods are apt to be regarded in the same manner, if they are not already so regarded. Axelson is engaged in manufacturing standardized products of the finest quality that will yield uniform satisfaction in the largest number of installations. We recommend for the Industry's consideration a policy of sucker rod standardization as reflected in these specific types:

●

A First Rod *of high quality, moderately priced for use in light and reasonably heavy pumping operations.*

A Second Rod *of excellent quality, with high tensile, high ductile characteristics which meets reasonably-heavy, heavy and extra-heavy pumping conditions.*

A Third Rod *combining the best features of the Second, but with the added advantage of meeting conditions in wells where corrosion constitutes a problem.*

Axelson Manufacturing Company, P. O. Box 710, Vernon Station, Los Angeles • St. Louis • 50 Church Street, New York • Tulsa
Mid-Continent and Eastern Distributor: Frick-Reid Supply Corp. • *Rocky Mountain Distributor:* Great Northern Tool & Supply Co.

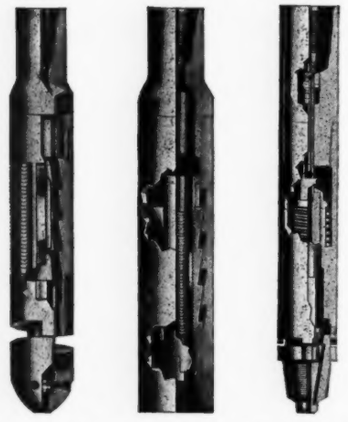
OIL WELL PUMPS **AXELSON** SUCKER RODS

TRAVEL THE SURE ROAD TO "FISH" RECOVERY!

SHAFFER ROTARY RELEASING SPEAR

SHAFFER ROTARY RELEASING SOCKET

SHAFFER EXPANDING PIN TAP



The outstanding tools for Spear and Socket work and the Pin Tap for left handing and stuck drill pipe in tight holes. See our section in the 1936 Composite Catalog. It begins on page 1143.

SHAFFER TOOL WORKS

BREA, CALIFORNIA • HOUSTON, TEXAS

OKLAHOMA CITY, OKLA

EXPORT-OIL WELL SUPPLY COMPANY

CUT DRILLING COSTS

by keeping your holes straight with

SYFO CLINOGRAPH

Sperry-Sun Well Surveying Co.

1608 Walnut Street, Philadelphia, Pa.
425 Petroleum Building, Tulsa, Okla.
3118 Blodgett Avenue, Houston, Texas
549 East Bixby Road (3800 Block, Atlantic Ave.), Long Beach, Calif.

speed. Having come about so unexpectedly it has apparently taken the Soviet operators by surprise, and many details and preventive measures necessary under the increased tempo have been overlooked. Operation is not in step with drilling, and an increasingly large number of breakdowns has resulted.

At Baku cave-ins at wells have become a frequent occurrence—more so than ever before. During April 278 cave-ins at wells were reported from Baku, 300 were reported in May and still more in June. Here again, Soviet drilling progress has not only exceeded expectations but has run ahead of production. While the drillers are able to complete a well 10 or 15 days ahead of schedule, as long as a month sometimes elapses before the production division is in a position to take over the well for operation. Meanwhile, the drillers remain idle for some time before receiving a new assignment.

When Grozni production plans for the years 1934 and 1935 were being prepared, the optimistic figure of 500,000 tons per year was decided upon. Although Grozni operators contested such a high estimate, this figure was included in the plans. Actual production, however, was not possible before 1936, or three years later.

The Soviet journal ZA INDUSTRIALIZATIU, commenting on the delay incurred in bringing new Grozni fields under production, put all the blame at the door of the management, charging lack of efficiency in completing the test well. Drilling progressed slowly and more than a year was lost owing to lack of skill in cementing the well to prevent flooding. Several wells drilled at Izberbash were flooded and had to be abandoned about 50 ft. from the projected drilling depth. When well No. 8 at Izberbash was completed for flowing production, the well was not considered indicative of the productive layer, which the geologists thought much nearer the shore line. In order to test the productive layer it was decided to sink well No. 6 under deep drilling nearer the shore. Drilling was mismanaged and a serious breakdown has set in at about 5,000 ft. and it is likely that the well will be abandoned. This means that the test will be delayed for another six months or perhaps longer. ZA INDUSTRIALIZATIU further tells how at other new properties of Grozni drilling was placed in charge of experienced and reliable drillers drawn from the October fields of Grozni, but all labor was drawn from the native population, possessing no oil drilling experience whatsoever. The reporter for ZA INDUSTRIALIZATIU made inquiry about the progress of drilling at Omaovo field (Grozni) and received the reply, "We are not drilling, mister, we are simply having fun."

Well No. 9, now drilling, is a substitute for well No. 7 which, in turn, was a substitute for another well which went crooked in drilling. Since the substitutes were sunk some 200 ft. away from the original well which went crooked, naturally the substitutes went crooked too. Crookedness set in at each of these wells at a depth of 1,200–1,250 ft., following the line of the shaft of the original well, and had to be abandoned. Many other attempts were made to drill a straight well, but they apparently were sunk too near the original location and a crooked hole always resulted. The journal asks, "Will Gronzi be able ultimately to solve the problem of well No. 7 at Omaovo?"

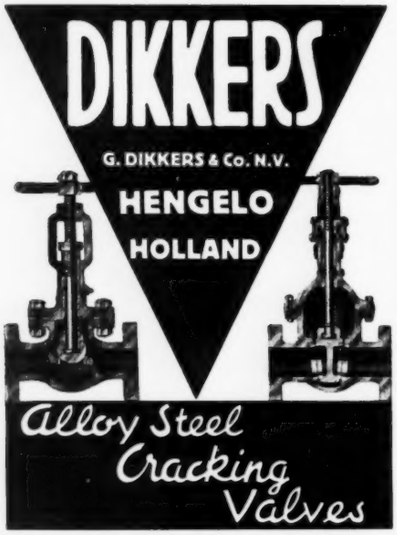
At Mushin Biru, also a new region of Grozni, three wells were started under Crelius drilling and all looked well until breakdowns set in because of inferior quality pipes and tubing. Likewise at Taimir Kala, a new prospecting property of Grozni, three wells were initiated with Crelius equipment, tests having shown oil saturation at depths of 100–150 ft. No progress has been made, however, owing to employment of inexperienced labor chosen from among coal miners of the Don coal basin. These men fully understood that in coal drilling a stream of water should surround the bit, but could not comprehend why mud solutions should be required for oil drilling, nor why water was not good enough.

In an editorial appearing in PRAVDA, G. Lomov, former head of the Soviet oil industry, analyzed the present situation. Among other statements, he made the following observations:

> "While drilling is forging ahead and making steady progress, the production division continues to carry intolerable arrears. The organization and technique of production has changed but little from the methods studied and learned by Soviet operators while on visits to the United States in 1928–29. Deep pumping introduced in Soviet fields in 1925 has remained unchanged for the past 12 years, in practice as well as in pump design. Deep pumps operated in Soviet fields several years ago could work continuously for at least 90 days, but the maximum operating period today does not exceed 50 days and the average is no more than 20 days. Soviet operators know only too well that several types of pumps are required for individual operations, but they have never followed this practice. Pipe, tubing, hoists and other equipment have not been modified, the same type apparatus being used today in the drilling of 4,000–6,000 ft. wells as was formerly used to drill 1,500 ft. wells.
>
> "Compressors used in Soviet production are being operated without control or measuring instruments. The flow of air is being regulated simply by the revolutions of the air valve. Field operators have admitted on several occasions that indicators to regulate compressors would improve the operation efficiency 50 percent. But for such service technically trained operators are required and in Soviet fields only untrained help is available. Airlines and distributing junctions are not given proper attention, air is leaking from all connections, and the administration has become so accustomed to such mismanagement that any change for the better would be annoying or disturbing. A reluctance to change reigns supreme in Soviet oil fields. With each decree for a change a storm of shock brigaders come in and effect improvements immediately, but as soon as the initial zeal dies down all improvements are wiped out and the old methods are back again."

SOYUSNEFTEXPORT has sold a large part of its bulk distributing facilities in Germany to the Benzolverband of Bochum. This transaction follows the sale of Soyusneftexport's German subsidiary DEROP, reported during

What
about Centrifugal
Acid Treating
by SHARPLES?
It's too long a story to tell in detail here but . . . On heavy lubes save 30% of treating loss and use less acid. A compact continuous process. Treat pressure distillate at 4000 bbls. per day per centrifugal unit. Save . . . anti-knock, acid, caustic, time, space, and increase yield of E. P. Gasoline.
On white oils . . . save acid, eliminate hazards of SO_2 fumes, cut treating time from days to hours, reduce inventories and fill orders more promptly and use one-quarter the space. Refiners may expect any Sharples-designed plant to operate satisfactorily producing specification product from its first day. No installation is cheap if it gives much trouble.
The Sharples Specialty Co.
2323 Westmoreland Street
Philadelphia, Pa.
SHARPLES Centrifugal Engineers



STORAGE TANKS

any capacity
for OIL, PETROL, ETC.
ELECTRICALLY WELDED
We are experts in the designing, manufacture and erection of Electrically Welded Tanks.

COMPLETE INSTALLATIONS

Send us your Enquiries

OXLEY ENGINEERING CO. LTD.
LEEDS, 10 ENGLAND
Telephone: LEEDS 27468 Telegrams: OXBROS LEEDS
LONDON OFFICE: Winchester House, Old Broad Street, E.C.2
Telephone: LONDON WALL 3731-3732

JOHN I. JACOBS & CO., LTD.

Oil and Tanker Brokers

15, ST. HELEN'S PLACE
LONDON, E.C.3.
Cables: Cosmos, London

last year. DEROP was a retailing marketing organization, while DERUNAPHT was the bulk marketing organization formed in 1926 for Soviet oil trade in Germany, Austria, Czechoslovakia and Hungary. In 1928 DEROP was formed to protect the position of the Soviets in the retail gasoline and oil products trade, which was threatened by other large oil combines.

DERUNAPHT in Germany was organized along the lines of the Soviet marketing organization ROP in England, Societe des Produites du Napthe Russe in France (Soviet oil distributors in France, Belgium, Holland, Luxemburg, Spain and Portugal), Napthesydicate Actiebolaget in Stockholm (distributors in northern Europe), and other agencies in various markets. The Soviets desired to acquire and develop their own distributing facilities in order to regulate Soviet international trade and meet competition. The peak of Soviet oil exports was reached in 1932 when over 6,000,000 tons of oil valued at about Rbl. 107,000,000 were exported. Since that time, however, oil exports have declined year by year.

Soviet Oil Exports

1929	3,815,000 tons
1930	4,803,000 "
1931	5,224,000 "
1932	6,106,000 "
1933	4,894,500 "
1934	4,315,000 "
1935	3,353,700 "

The steady growth of internal consumption and the decline of Grozni production since its peak in 1931 has checked Soviet oil exports and caused the transfer of nearly all important oil sales to Moscow. The sale of DERUNAPHT in Germany and the recent sale of the Soviet marketing organization in South Africa, to interests representing Socony-Vacuum and The Texas Corporation, are indicative of the present Soviet policy. This policy might, however, prove to be only temporary and the sale of some of the Soviet marketing organizations abroad hardly justifies the conclusion that the Soviets desire to withdraw entirely from world markets. BENZOLVERBAND has recently contracted to import large quantities of Soviet oil into Germany. During 1935 almost 500,000 tons of Soviet oil were imported into Germany, thus placing Germany in first place as an importer of Soviet oil.

Since acquiring distributing facilities in Germany BENZOLVERBAND has strengthened its position on the German market considerably and has purchased large quantities of Soviet gasoline, gas oil and lubricating oil, facilitating such purchases by some sort of barter trade, without having to pay cash. BENZOLVERBAND is backed to some extent by the German Coal Mining organization, which enjoys a government subsidy for the increase of domestic output of synthetic oil. It will thus be able to blend Soviet oil with domestic products for which no gold payments will be required. BENZOLVERBAND marketing facilities will now be comparable to those of any other large oil organization trading in Germany, and will probably also handle fuel oil, Diesel oil and lubricating stocks.

J. WEGRIN

STRENGTH
High grade alloy steel resists shock loads.
WEAR
Unequalled resistance to wear. Fridging of parts impossible.
UPKEEP
Minimum maintenance. Patented cotters absolutely reliable.

Send for leaflet Ref. No. 216/32.

RENOLD "MARK 3"
To AD specification OIL WELL CHAIN
THE RENOLD & COVENTRY CHAIN CO. LTD., Manchester, Eng.
AGENTS THROUGHOUT THE WORLD

Afonin
FLOATING ROOF
Reduces Evaporation Losses and Fire Hazards
SIMPLE—SAFE—ECONOMICAL
Installations have been made WITH and WITHOUT Permanent Roofs
World Manufacturing Rights controlled by
THE AFONIN SEALING RAFT CO., LTD.
Berlin, W. 15 Bregenzerstr. 7. Germany
UNITED STATES: George W. Farny, Consulting Mining Engineer, Craftsman Farm, Morris Plains, N. J.
GREAT BRITAIN: B. J. Hesse, 117, Fenchurch Street, London, E.C. 3
FRANCE: Etabs. Delattre & Frouard Reunis, 39, Rue de la Bienfaisance, Paris. (Licensees for France)
GERMANY: Eisenwerk Wulfel, Hannover (Licensees for Italy, Holland and Roumania)

TO THE OILFIELDS OF
IRAQ-IRAN-BAHREIN
by
SIMPLON ORIENT-EXPRESS
TAURUS EXPRESS
Trains composed entirely of 1st and 2nd Class Sleeping and Dining Cars. Departures from LONDON and PARIS twice weekly. Single Tickets with 25 per cent. reduction. Return Tickets with 32·5 per cent. reduction. Considerable reductions for parties of eight passengers. Packets of Merchandise can be forwarded by these trains.
Apply to any office of
COOK/WAGONS-LITS